Link Adaptation for 802.16m

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Venue:

IEEE 802.16m-08/024, "Call for Comments and Contributions on Project 802.16m System Description Document (SDD)".

Target topic: "Link Adaptation schemes".

Base Contribution:

None

Purpose:

To be discussed and adopted by TGm for the 802.16m SDD

Notice:

Release:

Patent Policy:

Link Adaptation for IEEE 802.16m

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About This Contribution

- **Goal and scope of this presentation**

  - Propose a link adaptation scheme for 16m.

- **Issue to be resolved in this contribution**

  - Mechanism of MCS adaptation

  - CQI feedback for MCS selection in DRU/LLRU allocation mode

Related Issues and Contributions

- **Link adaptation**

    - Adapt transmit power/MCS level and(or) frequency selective resource to track the change of time-frequency radio channel condition.

- **Related issues**

    - Power adaptation

        - Refer to contribution IEEE C80216m-08_675

    - MCS adaptation

        - Modulation & Coding – FFS

        - Mechanism of MCS selection – Scope of this contribution

    - CQI feedback method for DRU/LLRU allocation mode

        - Scope of this contribution

Mechanism of MCS Selection in 16m

- **Dynamic MCS selection for dynamic allocation**

  - BS determines MCS level suitable for the estimated radio channel condition based on CQI report from MS and(or) etc.

  - BS indicates the determined MCS level via Unicast Service Control Channel → Dynamic change of MCS per sub-frame/frame

- **Semi-static MCS change for persistent allocation**

  - MCS level is pre-determined in order to avoid excessive overhead.

  - Adapt transmit power to track short term radio channel variation.

  - If the pre-determined MCS level is no longer appropriate,

    ➢ MCS level can be changed upon reallocating MCS level and resource region via Unicast Service Control Channel without release/establishment procedure.

CQI Feedback (1/2)

- **CQI feedback channels**
  - Basic fast feedback channel
    - ➢ Robust MCS level → Smaller bit size
    - ➢ Suitable for cell-edge user
  - Enhanced fast feedback channel
    - ➢ Higher MCS level → Enable enhanced feedback using larger bit size
    - ➢ Suitable for non cell-edge user
  - Both support wideband/frequency selective CQI with/without MIMO.

- **CQI feedback for MCS selection in DRU allocation mode**
  - Preferable MCS level at MS side
    - ➢ Less overhead
    - ➢ MS can select better MCS reflecting MS's capabilities such as receiver structure and channel estimation method.
    - ➢ BS may determine different MCS level to compensate coarse adaptation due to lack of BS information such as encoded packet size and resource budget.

CQI Feedback (2/2)

- **Frequency selective CQI feedback in LLRU allocation mode**

  - Initialization: [x] best subband selection

    - MS indicates best [x] subbands with their physical CINRs via REP-RSP message.

  - After initialization: Differential CQI feedback

    - Transmit differential CQI feedback via basic (or enhanced) fast feedback channel

  - Replace the selected subbands

    - MAC-configured change for basic (or enhanced) fast feedback channel

      - ✓ Reset or re-select the [x] best subbands and indicate via REP-RSP message.

    - PHY-configured change for enhanced fast feedback channel

      - ✓ Replace some of best subband(s) via enhanced fast feedback channel.

Best Subband Change Ratio

- **Average # of best subband change ratio after x msec**
  - 1~2 best subbands should be replaced after 20msec in average.
  - Need fast replace of best subbands
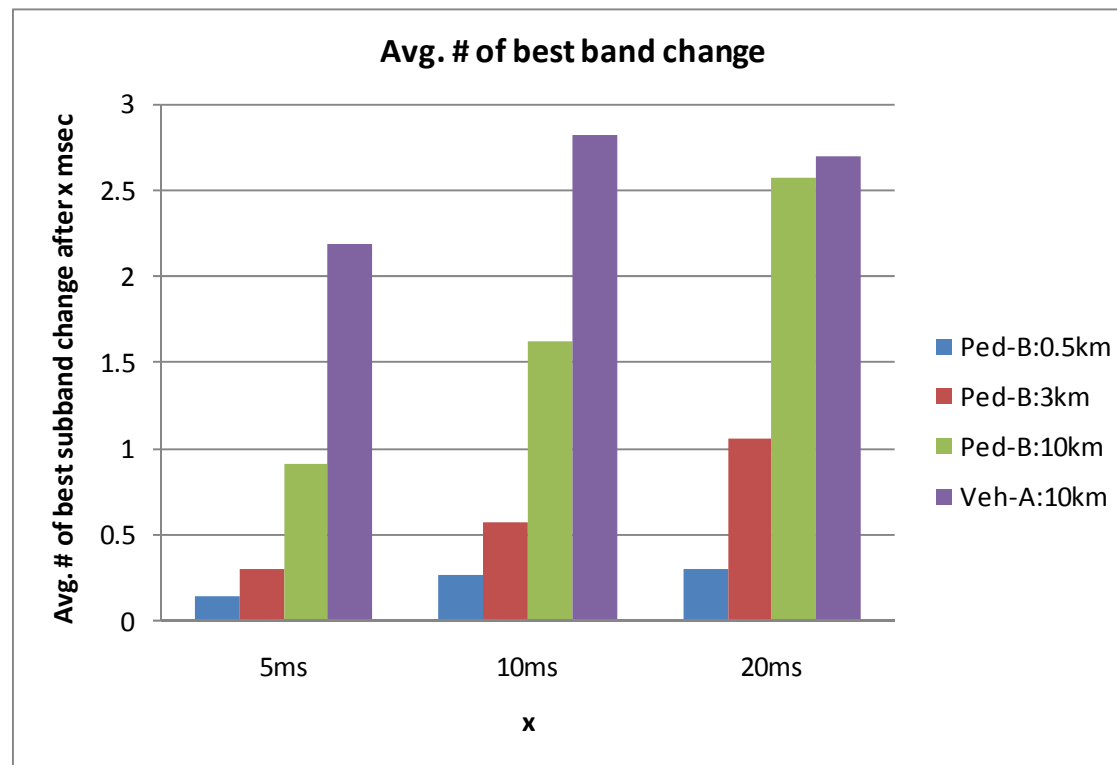
Channel BW : 10MHz (12 Subbands)

Text Proposal to 802.16m SDD

Insert the following text into Physical Layer clause (Chapter 11 in [IEEE 802.16m-08/003])

11.x Link Adaptation

There are two aspects of link adaptation i.e., MCS level/transmit power adaptation and frequency selective scheduling.

MCS level is dynamically adapted to track the change of radio channel. BS determines MCS level considering the available transmit power and radio channel condition. MS may select a preferable MCS level or physical CINR via basic(or enhanced) fast feedback channel as a type of CQI. BS determines MCS level referring to the reported CQI. MS shall apply the MCS level as indicated from BS.

MCS level can be pre-determined to avoid excessive control signaling such as persistent allocation. BS may change the pre-determined MCS level via explicit control signaling, if radio channel becomes no longer appropriate to support the MCS level.

For frequency selective scheduling, frequency selective CQI mode is configured upon approval from BS. After receiving frequency selective CQI, a favorable set of LLRU is assigned to a MS based on frequency selective CQI report.