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Title	**Proposal for general MIMO transmission structure for 16m system**
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Abstract	A general structure for MIMO transmission is proposed.
Purpose	Proposal for consideration in the 802.16m SDD
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Proposal for general MIMO transmission structure

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1. Introduction

The 16M requirement document [1] specifies that 16m system shall support advanced multiple antenna techniques, such as MIMO, beamforming, or others. And further both single-user and multi-user MIMO techniques have to be supported. In order to facilitate variety of MIMO techniques implementation in the system, we propose a general structure for MIMO transmission.

2. General MIMO structure

The following figure shows the diagram for MIMO transmission. Here, we show the processing at BS, the corresponding MS processing is omitted. Because MIMO, especially MU-MIMO, can be regarded as kind of interference management techniques, we introduce interference management (including FFR) in scheduler mechanism at BS. On the other hand, data from one user can be single stream or multiple streams, each corresponding to different services, for example, therefore, at the scheduler, BS can select appropriate group of users/data stream, even group of data stream for one user, or different users, according to some performance criterion, on the slot/sub-channel base. The decision information can be used for the following functions, such as FEC/MOD, MIMO encoder, Precoder, and even framing, and may further broadcast for the scheduled user at DL to facilitate the MS receiver.

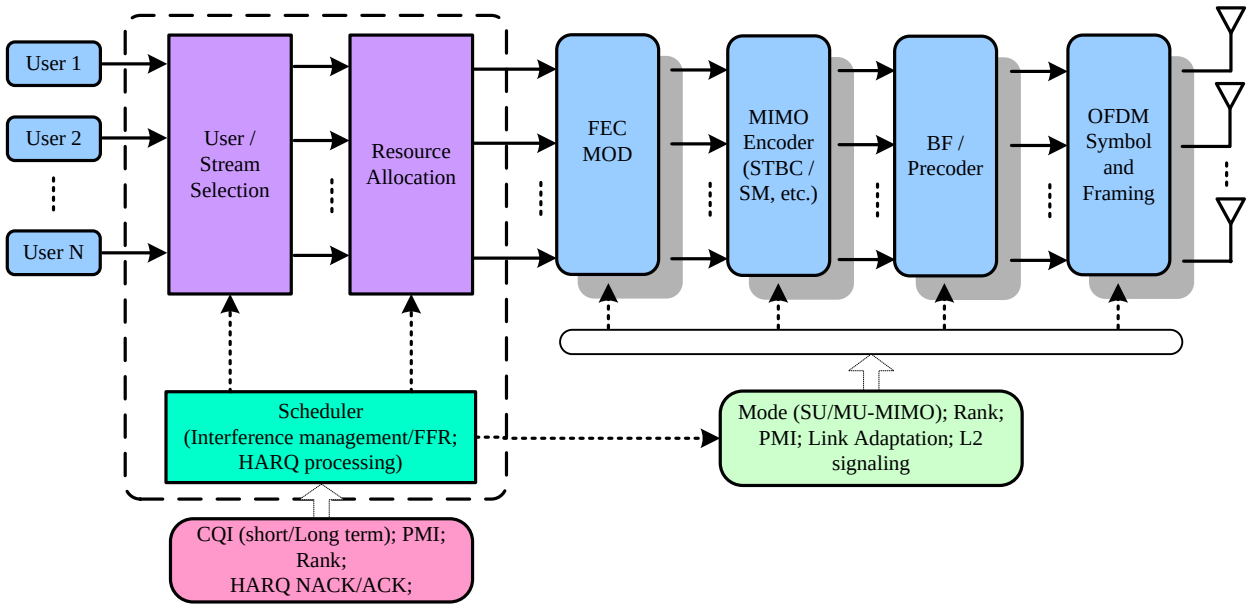

Figure 1 General MIMO transmission structure

3. Channel state information obtaining

To facilitate BS schedule users aiming to improve system throughput, it's possible to require that each MS feedback necessary channel station information both for SISO and MIMO case, such as CQI (short/long term), the preferred precoding vector/matrix index, the expected MIMO rank, and also the NACK/ACK signaling with HARQ retransmission. In order to avoid redundant overhead transmission at UL, the channel state information should be as less as possible, with exception that those kinds of CSI can significantly improve the DL

throughput.

4. Schedule mechanism

Using the obtained channel state information, the BS scheduler dynamically chooses the “best” set of users or streams and allocates the time/frequency resources at a given time. The scheduling approaches can be adaptively determined according to different criterions, such as maximizing the system throughput or achieving fairness for users with delay tolerant applications. HARQ process and interference management schemes should also be integrated with the scheduling operation.

To help MS receive data, the scheduler decision, such as MIMO mode (SU/MU-MIMO), selected Rank, Precoding vector, link adaptation decision, should be compressed and sent back to the scheduled MSs through the control channel.

5. Signal processing

The information bit streams of the scheduled users are Forward Error Correction (FEC) coded, modulated into symbol constellation, such as QPSK, 16QAM etc, according to the code rate, block length and / or HARQ indication information. Then the modulated symbols, if needed, are Space-Time Coded (STC) or Spatial Multiplexed (SM) to form multiple symbol streams for transmission on multiple antennas. Beamforming precoder weights the outputs of MIMO processor by the matrix or vector chosen from the codebook by the PMI indicator. The mapping operation is performed to allocate the information symbols of all scheduled users onto 2-D time-frequency resource plane which makes the multiple user transmission simultaneous (OFDMA), then the 2-D time-frequency signal is IFFT transformed, CP added and framing operated finally for signal transmission via wireless channels.

6. Impact to 16m system architecture

Figure 2 shows MIMO related functions within the main functionalities provided by different layers. Some functions may be the same as the functions which are defined by WirelessMAN-OFDMA Reference System for legacy support, or may be enhanced to satisfy the 802.16m system requirement. However, the overall system architecture is as same as WirelessMAN-OFDMA Reference System.

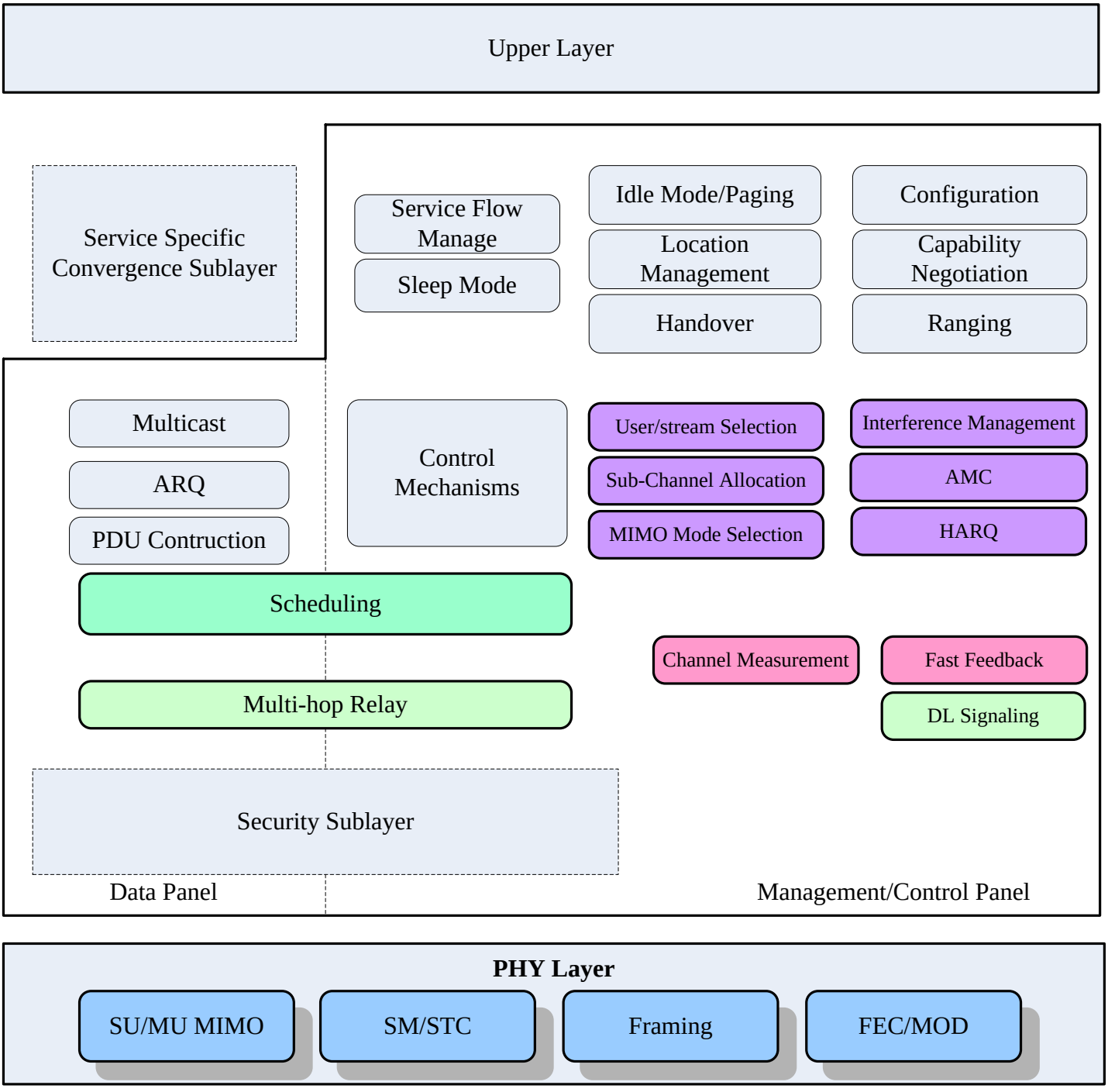

Figure 2 Proposed 802.16m main functionalities

7. References

[1] IEEE 802.16m-07/002r4, “IEEE 802.16m System Requirements”