

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >	
Title	Mobility Management with Multi-Carrier Support in IEEE 802.16m	
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Re:	IEEE 802.16m-08/005, "Call for Contributions on Project 802.16m System Description Document (SDD)". In response to the following topics: <ul style="list-style-type: none"> • Comments on the content of Section 8 of IEEE 802.16m-08/003 	
Abstract	This contribution depicts how the mobility management, mainly handover process, can benefit from the support of multiple RF carriers. Similar idea can also be applied to other function blocks including radio resource management and MBS. Text proposal and figure updates to describe multi-carrier support block and its interactions with other function blocks are also proposed to be included in Section 8 of 802.16m SDD.	
Purpose	To be discussed and adopted by TGm for the 802.16m SDD.	
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Mobility Management with Multi-Carrier Support in IEEE 802.16m

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Introduction

The multi-carrier function block has been mentioned in current 802.16m protocol structure but not been addressed yet. This contribution depicts how the mobility management, mainly handover process, can benefit from the support of multiple RF carriers. Similar idea can also be applied to other function blocks including radio resource management and MBS. A text proposal for the description of multi-carrier function block is also proposed to be included in the 802.16m SDD, and changes to the figures of MS/BS control/data plane processing flow are proposed to highlight the exchange of control primitives between multi-carrier support block and other benefited function blocks.

Multi-Carrier Supported Handover

The concept of multi-carrier supported handover is illustrated in Figure 1. A MS with 2 or more RF carriers maintains its user data transmission with serving BS on one RF carrier while perform scanning or network reentry procedures with target BS on another RF carrier. With the aid of extra RF carriers, data transmission can proceed without interruption during the handover process.

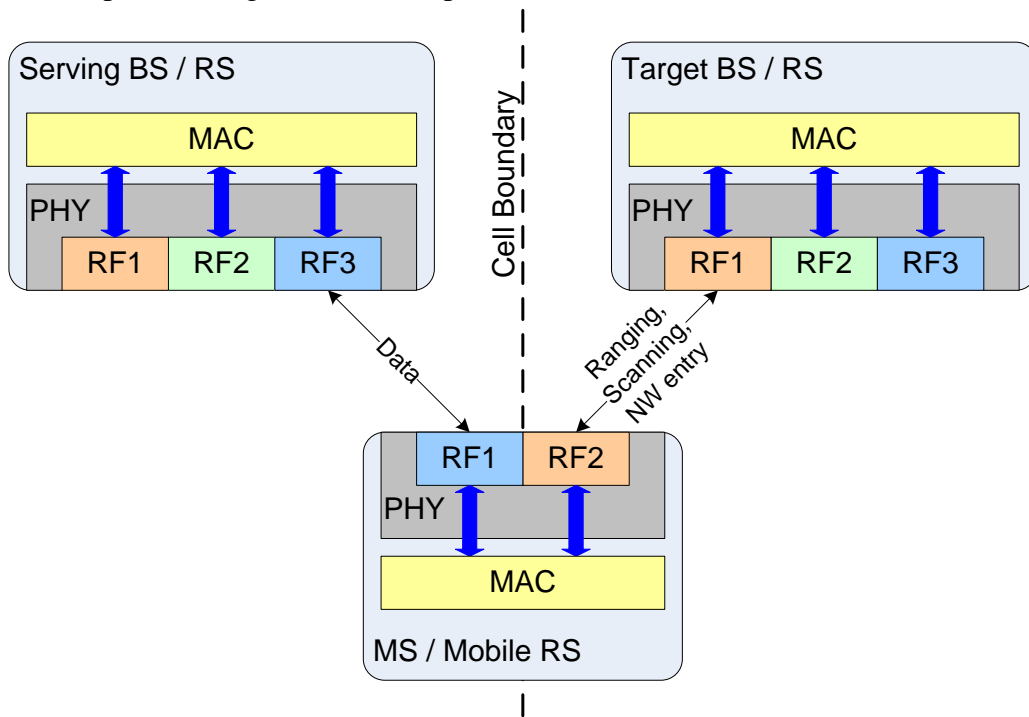


Figure 1. Multi-Carrier supported handover

A comparison between 802.16e hard handover and proposed multi-carrier supported handover is illustrated in Figure 2. As seen in Figure 2a, during the legacy handover period, data transmission is broken into pieces due to MAC management message transmission, interleaved scanning intervals and network entry procedures. With the support of multiple RF carriers, as seen in Figure 2b, data and MAC management messages (including scanning and ranging) can be transmitted on separated RF carrier in parallel. Therefore, user data traffic can be seamlessly migrated from serving BS to target BS without interruption.

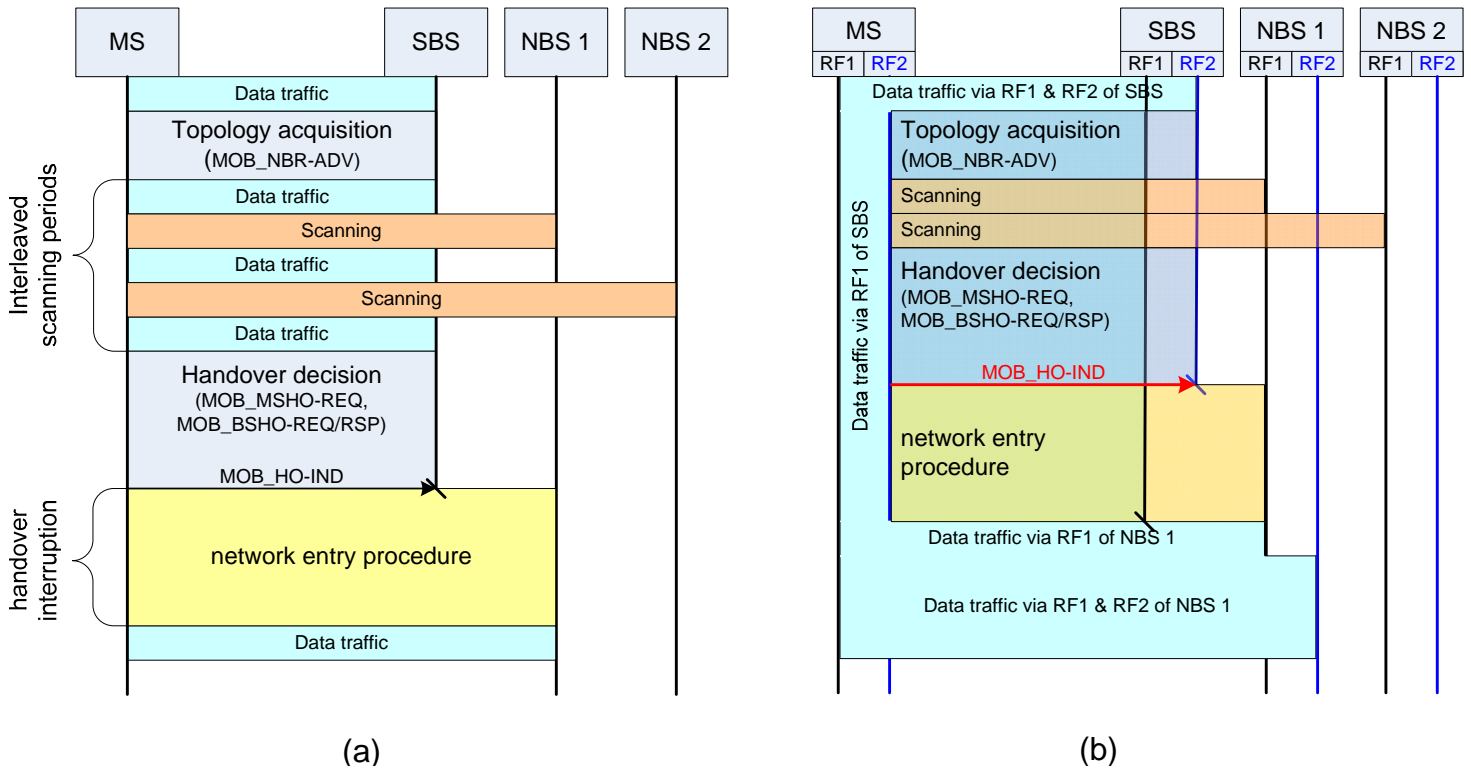


Figure 2. (a) 802.16e handover and (b) multi-carrier supported handover

HO in High Mobility

With the support of multiple RF carriers, MS which is moving in high mobility (e.g. 350 km/hour as required by 16m SRD) can always dedicate one RF carrier for scanning and network reentry to maintain network connectivity without interruption of data transmission.

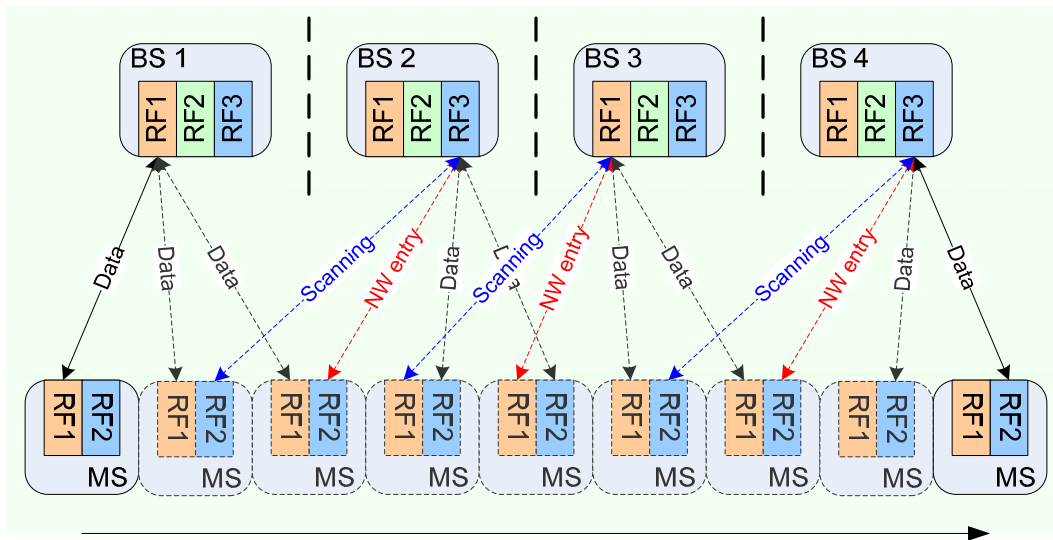


Figure 3. HO in high mobility

RRM with Multi-Carrier Support

Flexible resource planning and load balance can be realized by dynamically distribute users across multiple RF carriers, as illustrated in Figure 4. For users demanding high peak data rates, aggregation of RF carriers can be used to serve as a wideband channels. BS can also dynamically distribute its users across multiple RF carriers according to its traffic load.

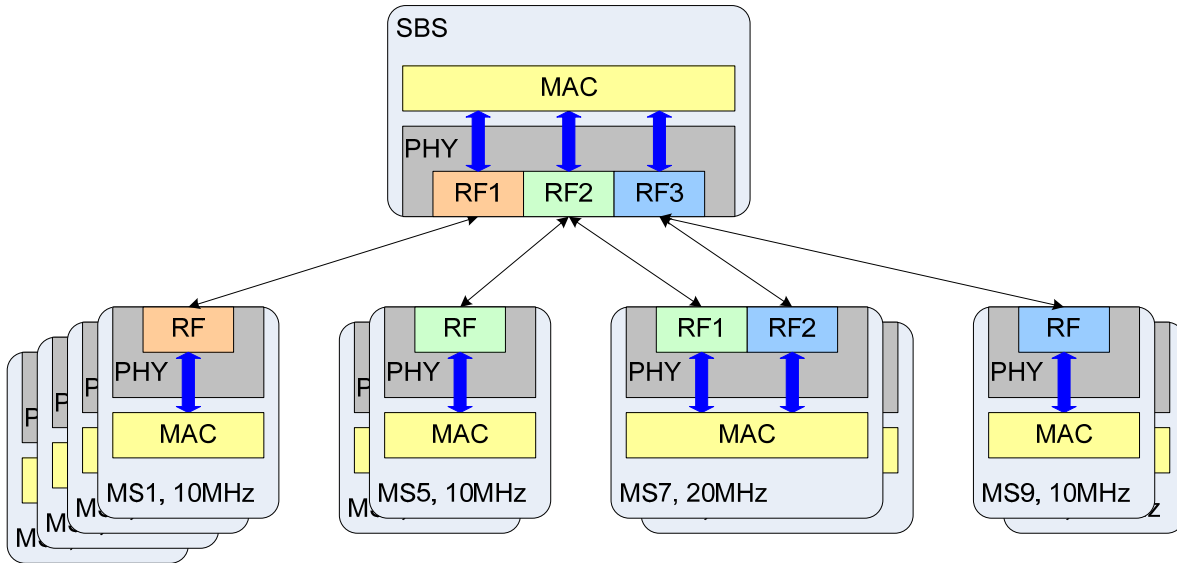


Figure 4. Load balancing across multiple RF carriers

MBS with Multi-Carrier Support

Scenario 1: coexistence/seamless switching between MBS and unicast services. MBS can be deployed on dedicated RF carriers while unicast services are performed on separated RF carriers.

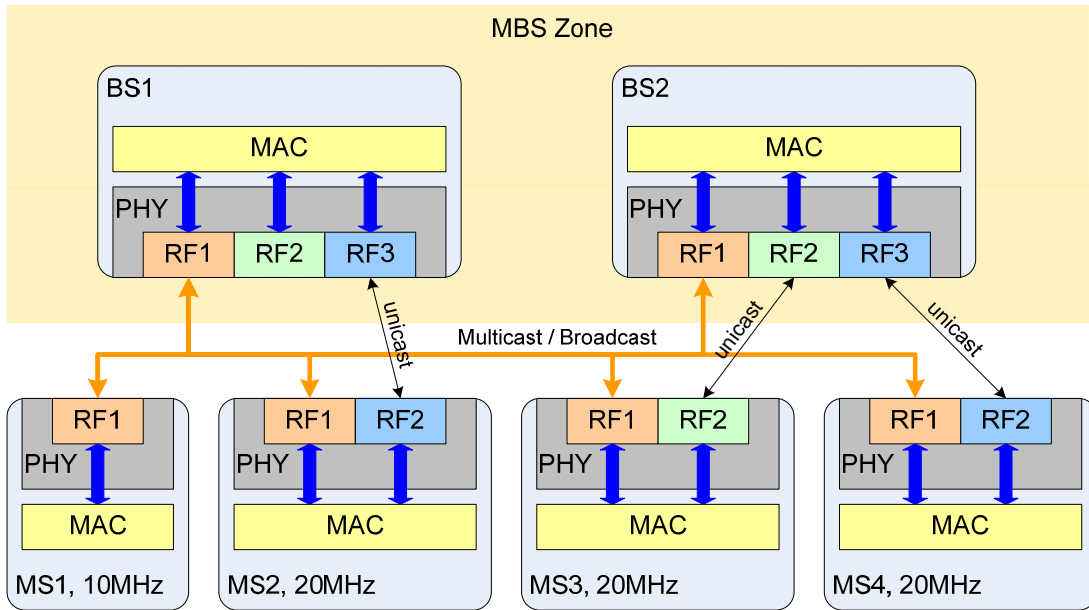


Figure 5. MBS over MB-OFDM PHY

Scenario 2: Non-interrupted MBS zone switching. MBS zone switching operations such as update of MCID and LCID can be performed on separated RF carrier to provide non-interrupted multicast/broadcast service during zone switching.

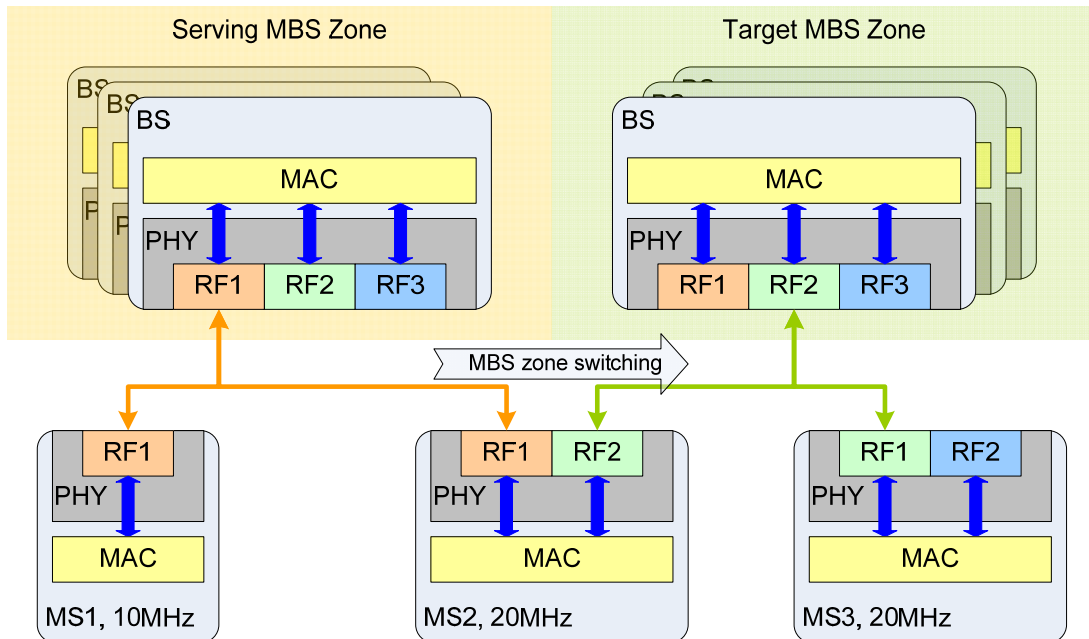


Figure 6. Non-interrupted MBS zone switching

Modifications to Control/Data Plane Processing Flow

Updates to the current 802.16m control/data plane processing flow is proposed to highlight the exchanges of control primitives between multi-carrier support block and other benefited function blocks, as seen in Figure 7 and Figure 8 (marked by red dotted rectangle). Control primitives between multi-carrier support block and other benefited function blocks are to be further studied.

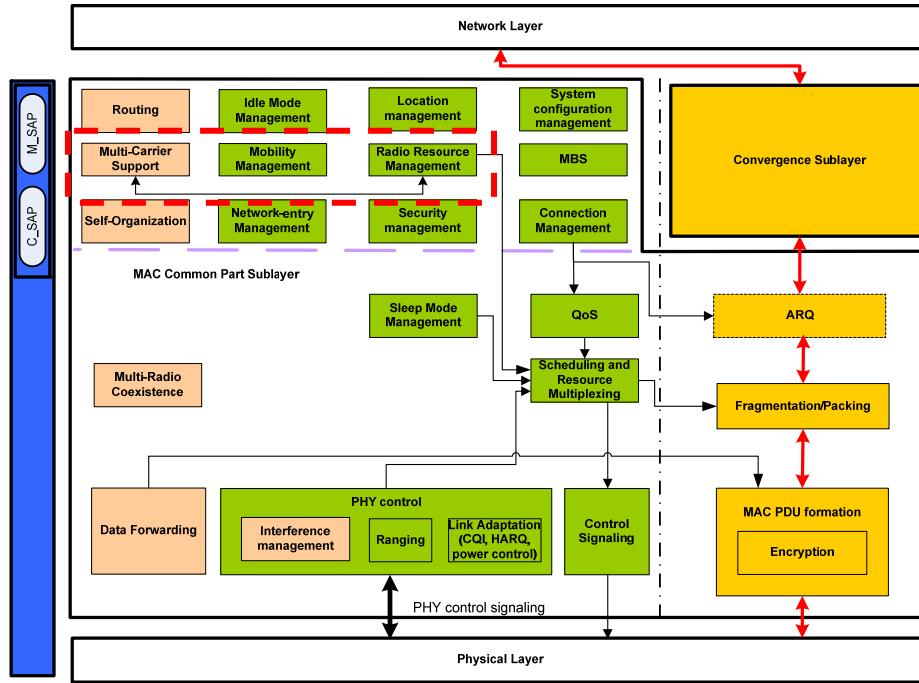


Figure 7. Modified 802.16m MS/BS Data Plane Processing Flow

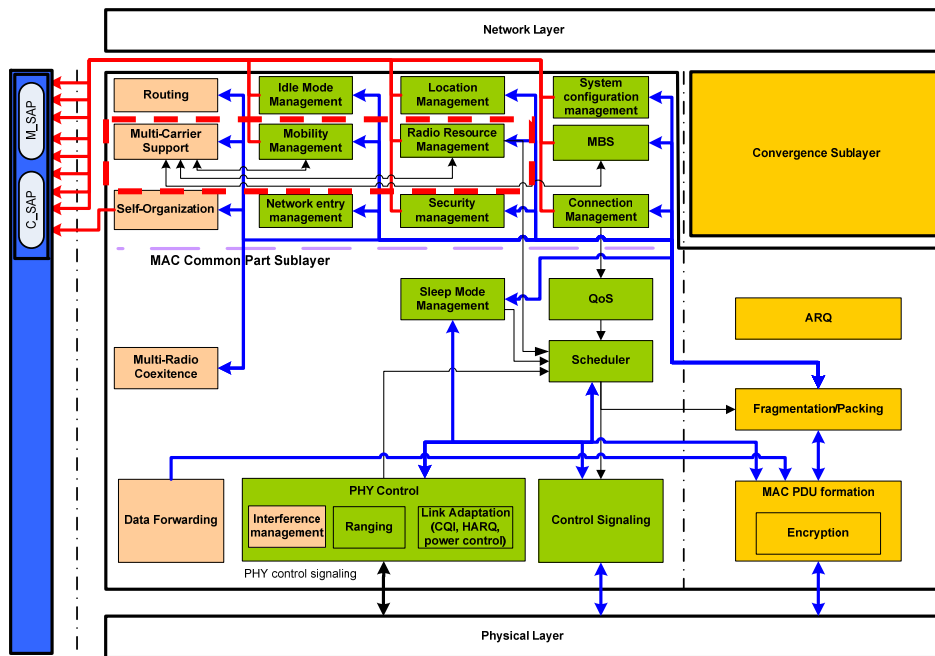


Figure 8. Modified 802.16m MS/BS Control Plane Processing Flow

Proposed Text for SDD

[In 80216m-08_003, Section 8.2, add the following text at line 14]

----- Text Start -----

Multi-carrier block enables multiple RF carriers to be deployed in contiguous or noncontiguous spectrum, and provides MS/BS abilities to distribute and handle control/data plane messages among multiple RF carriers. Multi-carrier block also interacts with and advances the performance of the following function blocks:

- **Mobility Management:** Fast handover using multiple RF carriers. MS can proceed its normal operation with serving BS on one RF carrier while perform HO procedures such as scanning and network reentry with target BS on another RF carrier.
- **Radio Resource Management:** Flexible resource planning and dynamic load balance across multiple RF carriers. Aggregation of multiple RF carriers can be used to create wideband channels for users demanding high peak data rates. BS can also dynamically distribute its users across multiple RF carriers according to the traffic load.
- **MBS:** Coexistence/seamless switching between unicast and multicast/broadcast services and non-interrupted MBS zone switching. MBS can be deployed on dedicated RF carriers while unicast services are performed on separated RF carriers. Furthermore, MBS zone switching operations such as update of MCID and LCID can be performed on separated RF carrier to provide non-interrupted multicast/broadcast service during zone switching.

[In 80216m-08_003, Section 8.2.1, replace Figure 8 with Figure 9x below]

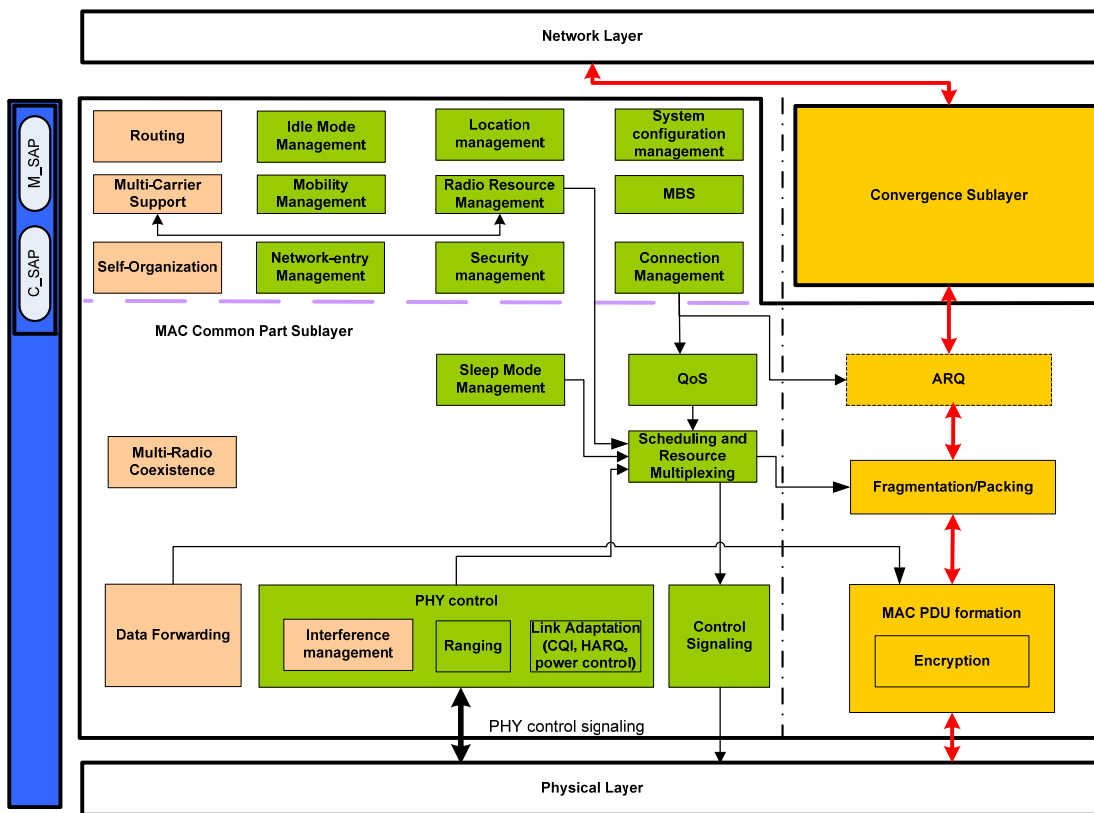


Figure 9x. The IEEE 802.16m MS/BS Data Plane Processing Flow

[In 80216m-08_003, Section 8.2.2, replace Figure 9 with Figure 10x below]

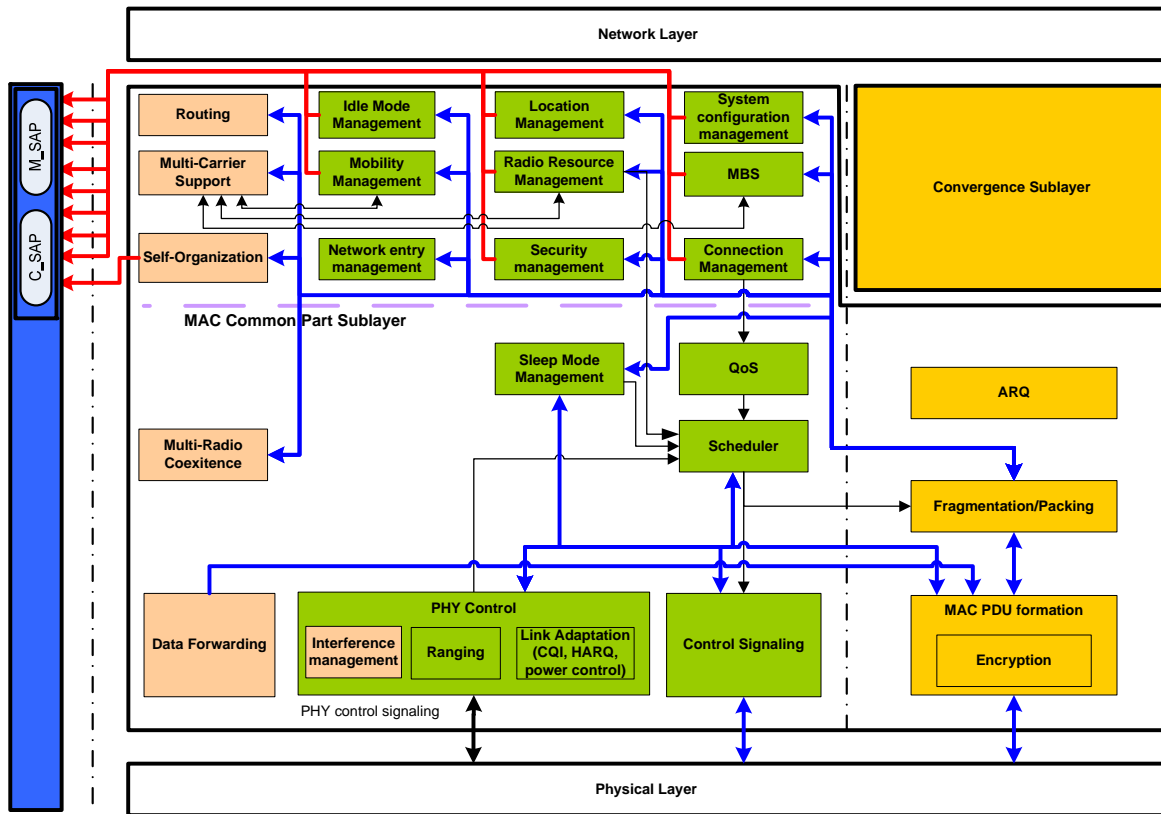


Figure 10x. The IEEE 802.16m MS/BS Control Plane Processing Flow

----- Text End -----

References

- [1] IEEE 802.16m-08/003, “The Draft IEEE 802.16m System Description Document”, January 2008.
- [2] IEEE C802.16m-08/092r1, “Proposal for Generalized Multi-carrier Support in IEEE 802.16m Systems”, January 2008.