Integrated Relay Architecture for IEEE 802.16m Systems

Document Number: S802.16m-07_299r3

Date Submitted: January 16, 2008

Source:

Sassan Ahmadi	e-mail: sassan.ahmadi@intel.com	Intel Corporation
Jerry Sydir	e-mail: jerry.sydir@intel.com	Intel Corporation
Hujun Yin	e-mail: hujun.yin@intel.com	Intel Corporation
Mo-Han Fong	e-mail: mhfong@nortel.com	Nortel Networks
Peiying Zhu	e-mail: pyzhu@nortel.com	Nortel Networks
Hang Zhang	email: hazhang@nortel.com	Nortel Networks
Sang-Youb Kim	email: sangyoub@nortel.com	Nortel Networks

Venue:

Levi, Finnland

Base Contribution:

IEEE C802.16m-07_299r3 or later revision

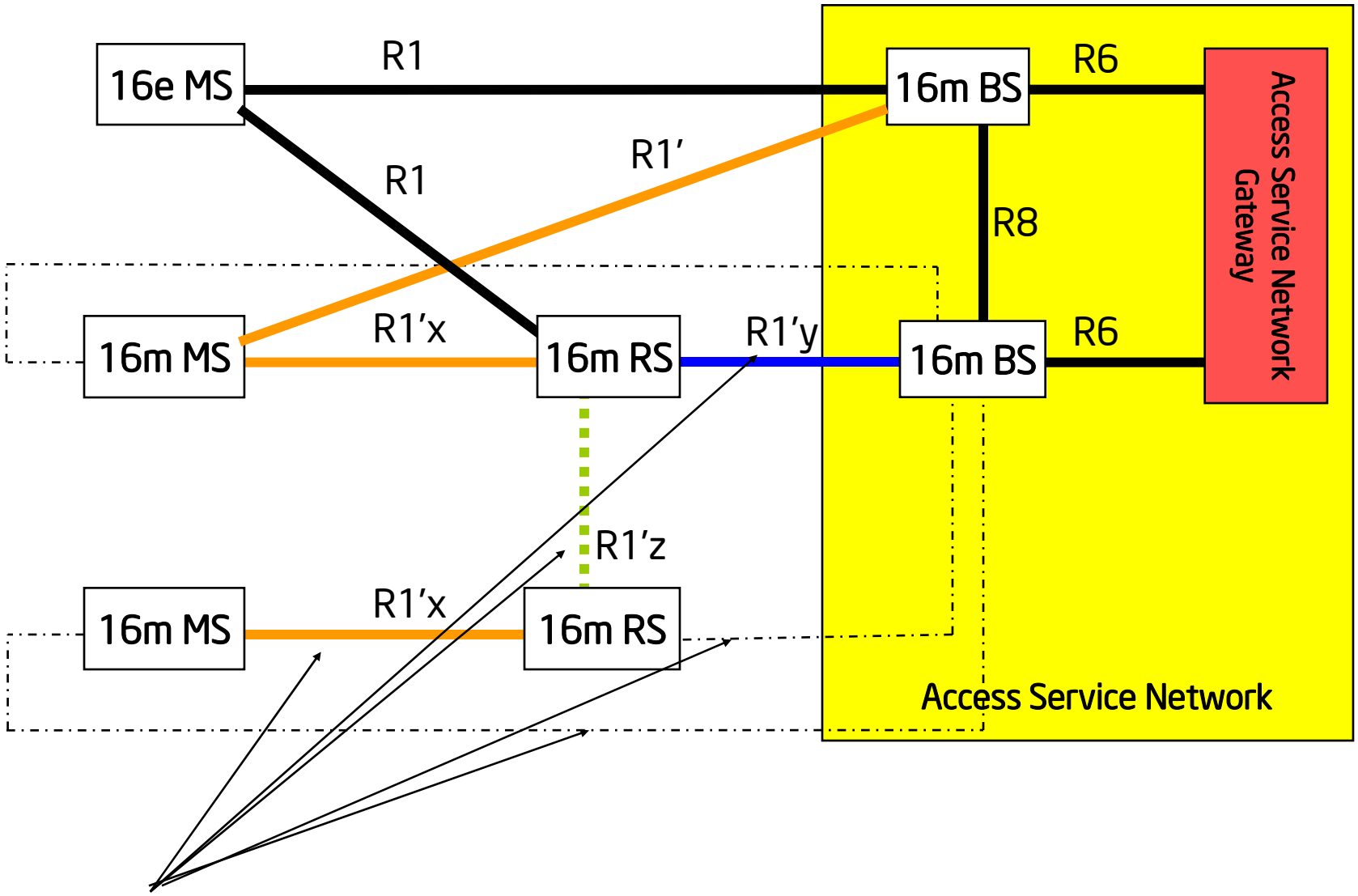
Purpose:

For discussion and approval by IEEE 802.16 Working Group (Consideration of integrated relay for IEEE 802.16m systems)

Outline

- Network Architecture
- Frequency Usage and Duplexing With Relay
- Relay Functional Architecture
- Classification of Data Plane Functions
- Data and Control Flows for RS nodes

Network Architecture



Layer 1 and Layer 2 protocols to be specified by 802.16m standard

Frequency Usage and Duplexing With Relay

- Support for shared channel (in-band) and dedicated channel (out-of-band relay)
  - Shared channel model – Multiple links share a frequency channel and coordinate the allocation of radio resources
  - Dedicated channel model – Individual links are assigned independent instances of frequency channels and schedulers do not coordinate the allocation of radio resources on the channels
- Duplexing schemes
  - Support both TDD and FDD deployments
    - FDD deployments include FDD and H-FDD MSs
  - Assume that entire network is either TDD or FDD
  - In FDD, all DL transmissions assigned to the DL band and all UL transmissions assigned to the UL band.

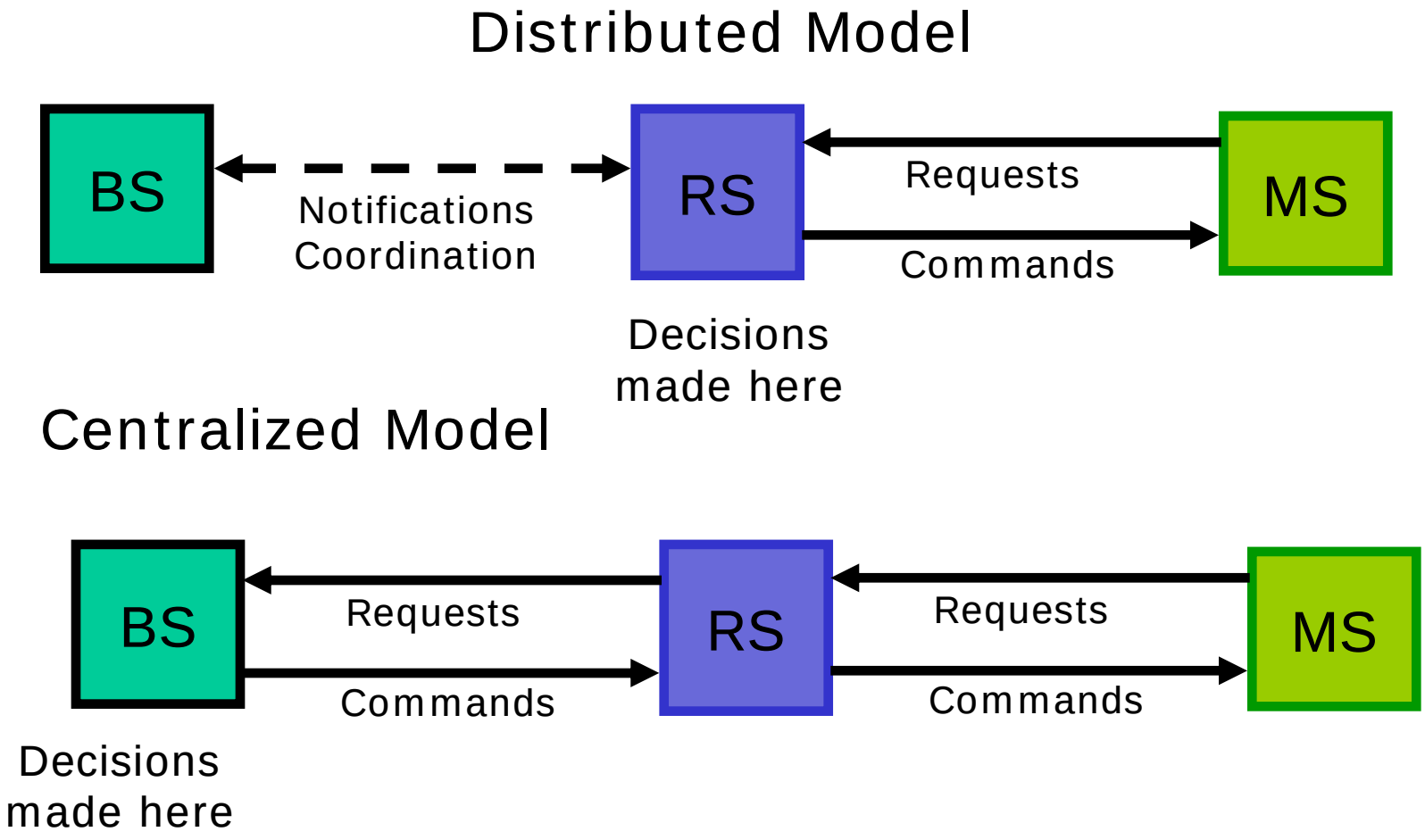
Relay Functional Architecture

- Integrated relay architecture
  - Extend 802.16j architecture by making MSs aware of the presence of RSs and the multi-hop nature of the path between them and the BS.
  - Some examples of how this is useful are
    - Allows better network entry decisions
    - Support for advanced relay techniques
- Relay support based on common set of relay functions
  - Define common relay functions supported by all RSs and all BSs which support relay operation.
  - More advanced relay functions specified on top of these common features
    - It may be the case that not all RSs implement these advanced functions.
  - This approach promotes commonality between potentially different RS types and discourages the creation of multiple, incompatible RS types.
  - The base relay function set includes a common relay frame structure.
  - Other members of the base relay function set and more advanced relay functions are for further study.

Data Plane Functions Classified as End-to-End and Hop-by-Hop

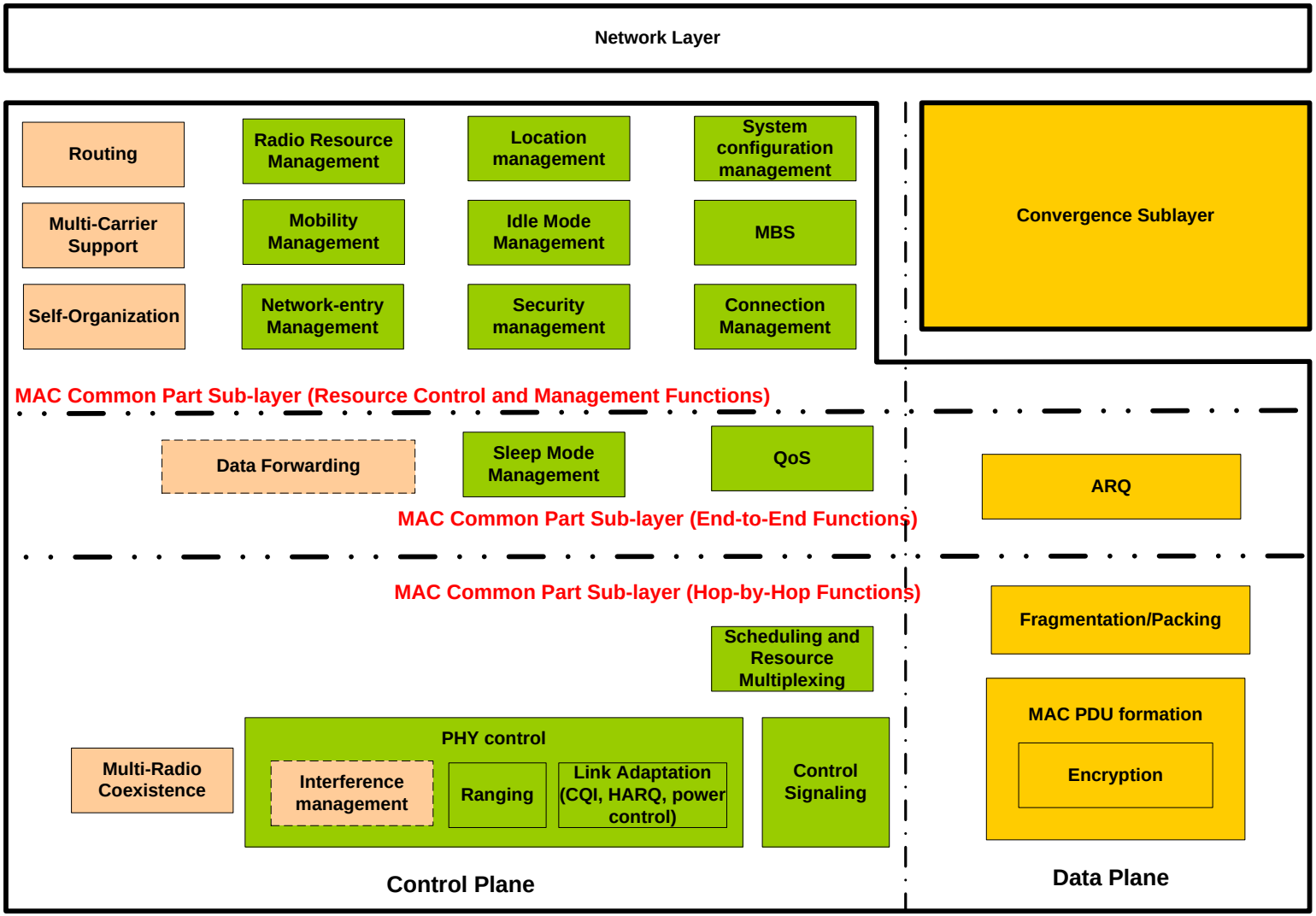
- Hop-by-hop Functions
  - Performed to transmit/receive data over a single hop in a multi-hop relay network.
  - Performed independently at each hop (coordination across hops is not required)
  - Performed in the same manner at each hop in the network
  - Some examples of such functions are link adaptation and scheduling.
- End-to-end Functions
  - Performed to transmit data across a multi-hop path.
  - Performed in a coordinated manner from source to destination
  - Can be performed differently at different stations along the path.
  - Some examples of such functions are packet forwarding, which is performed at all of the stations along a path, but is different at the source, destination, and intermediate nodes and ARQ, which is performed only at the source and destination.

Control Plane Functions Classified as Centralized or Distributed

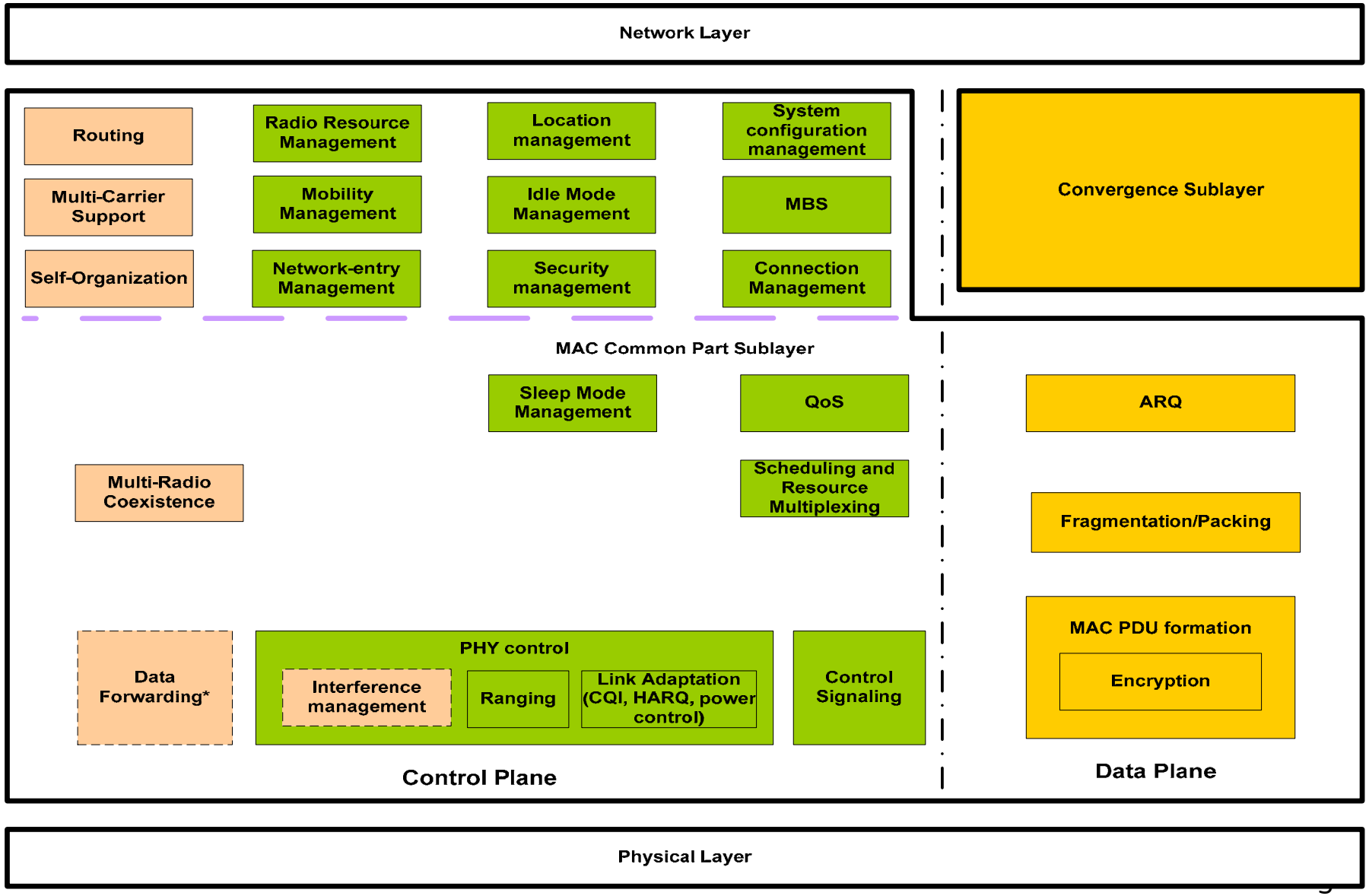


IEEE 802.16m Air-Interface Protocol Stack

Example Classification of Layer 2 Functions Across Data and Control Planes

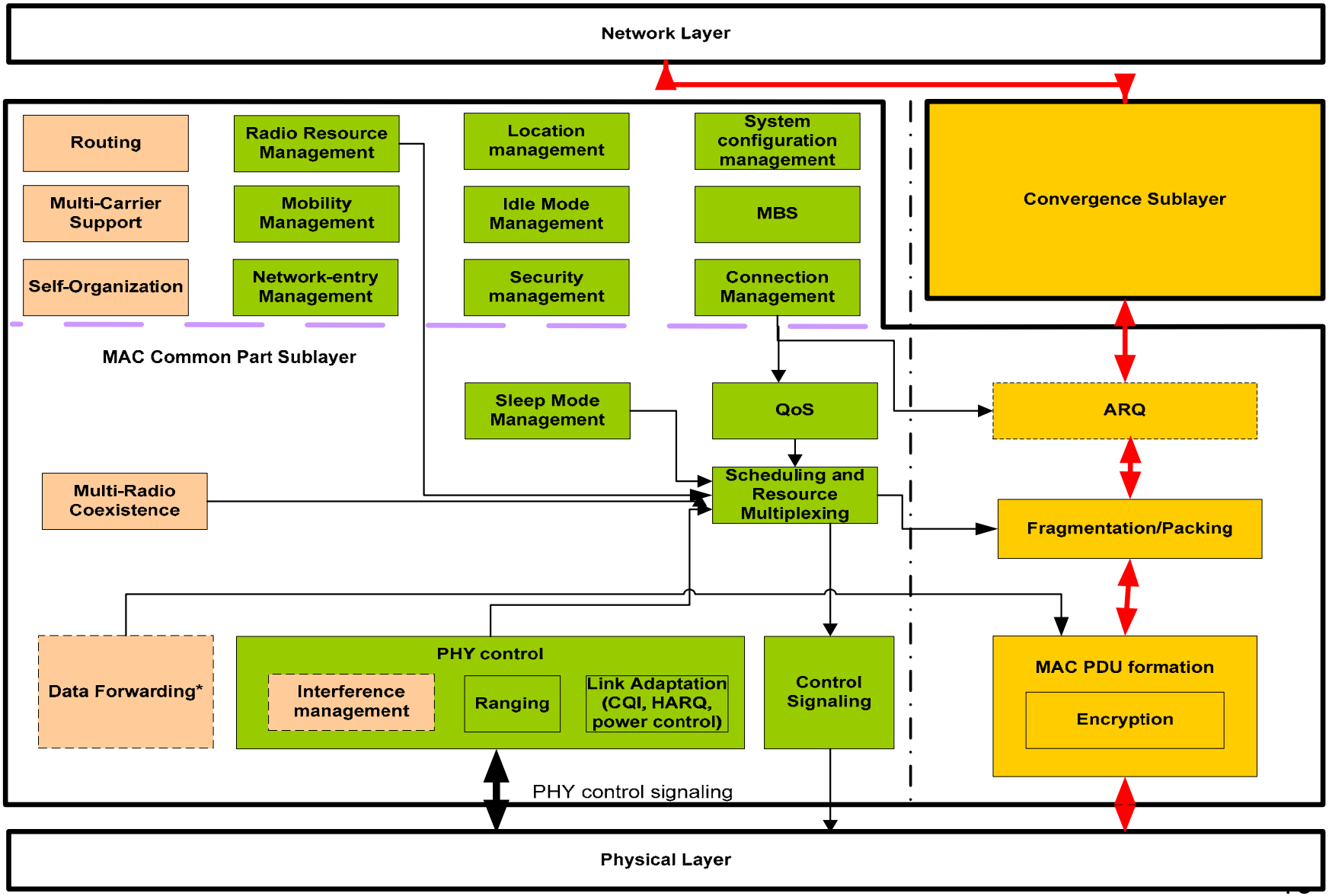


IEEE 802.16m Protocol Functions for End Nodes (BS, MS)



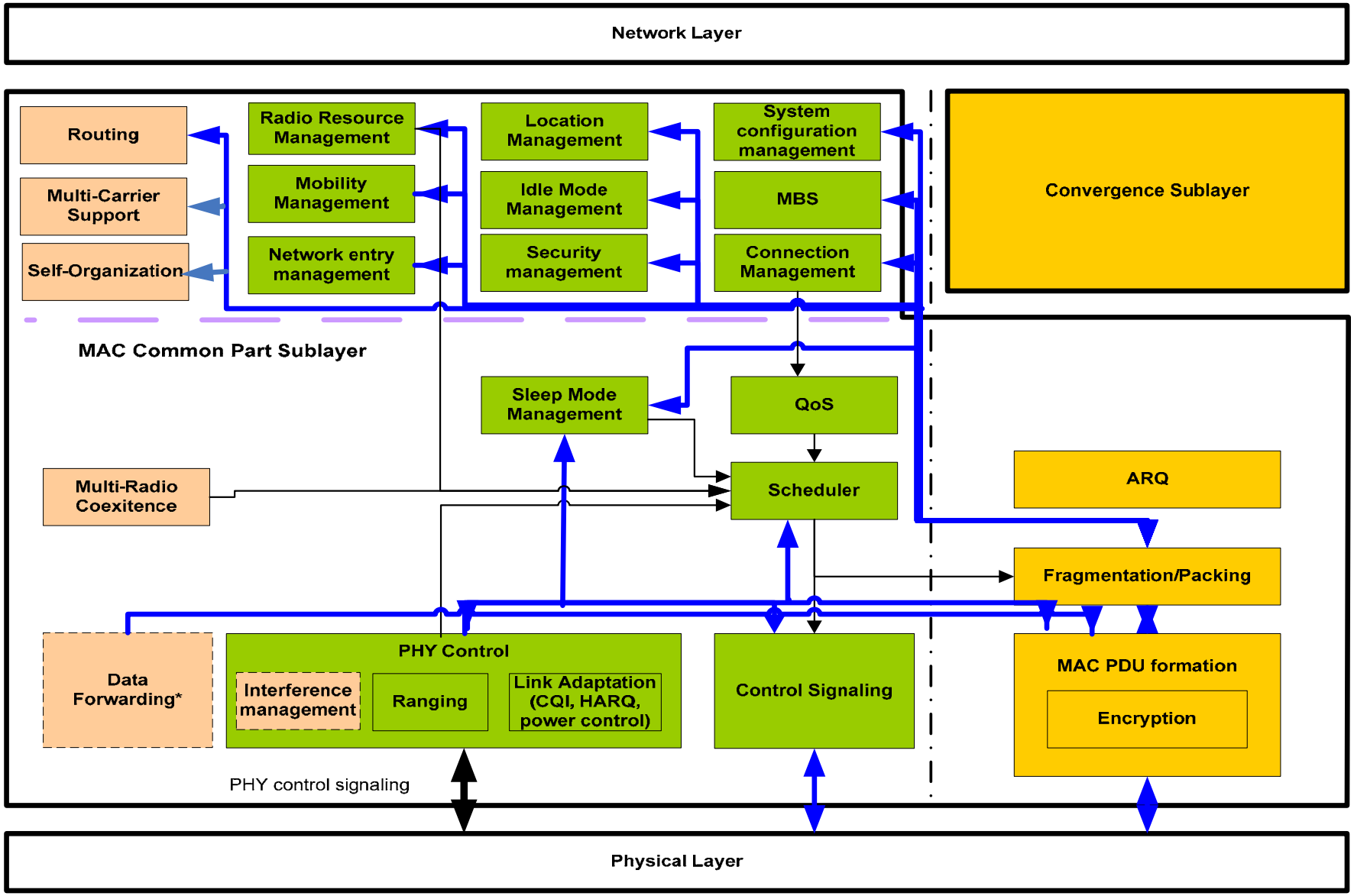
* Note that the Data Forwarding Function applies only to the BS

Data Flow for IEEE 802.16m End Nodes (BS, MS)



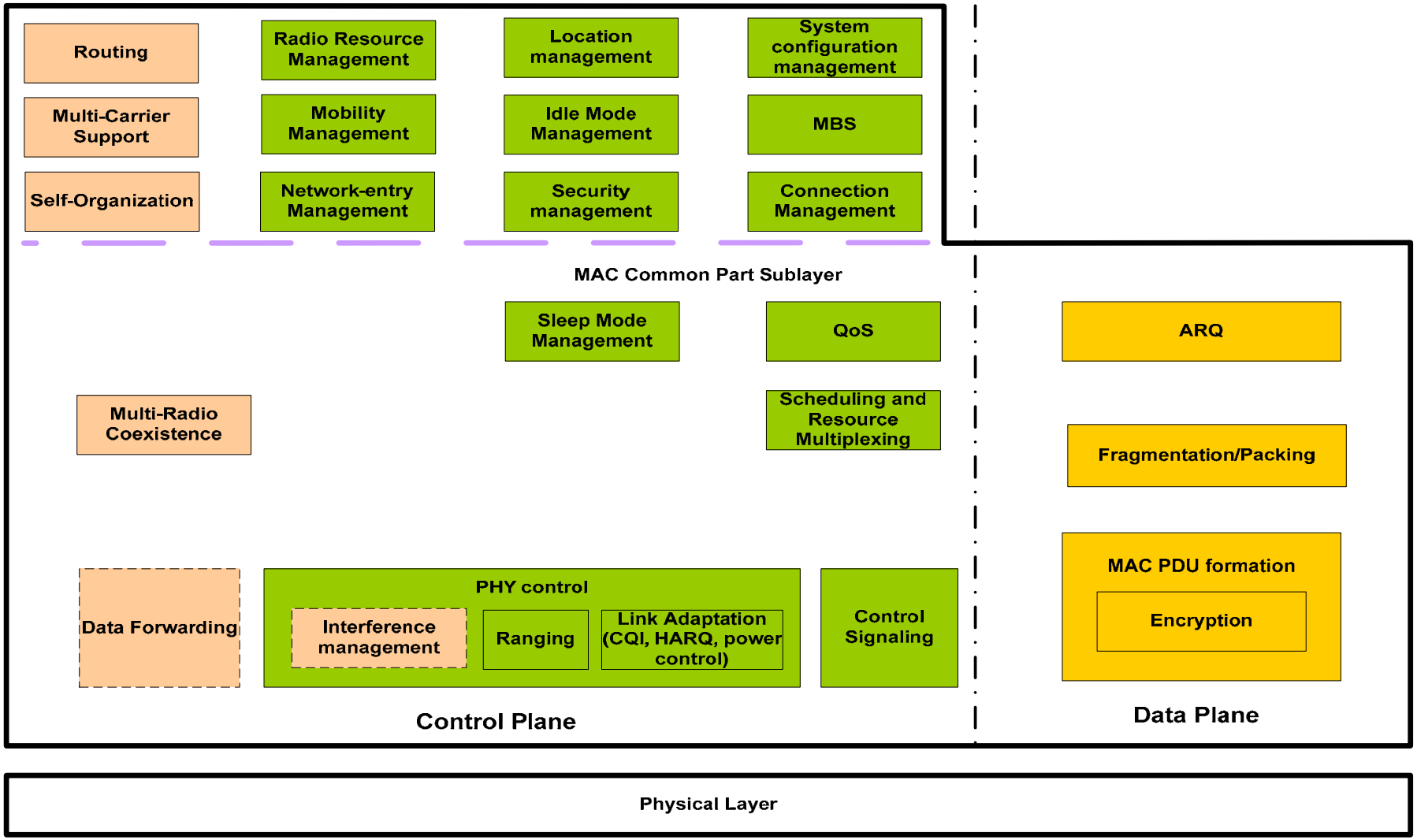
* Note that the Data Forwarding Function applies only to the BS

MAC Signaling Flow for IEEE 802.16m End Nodes (BS, MS)



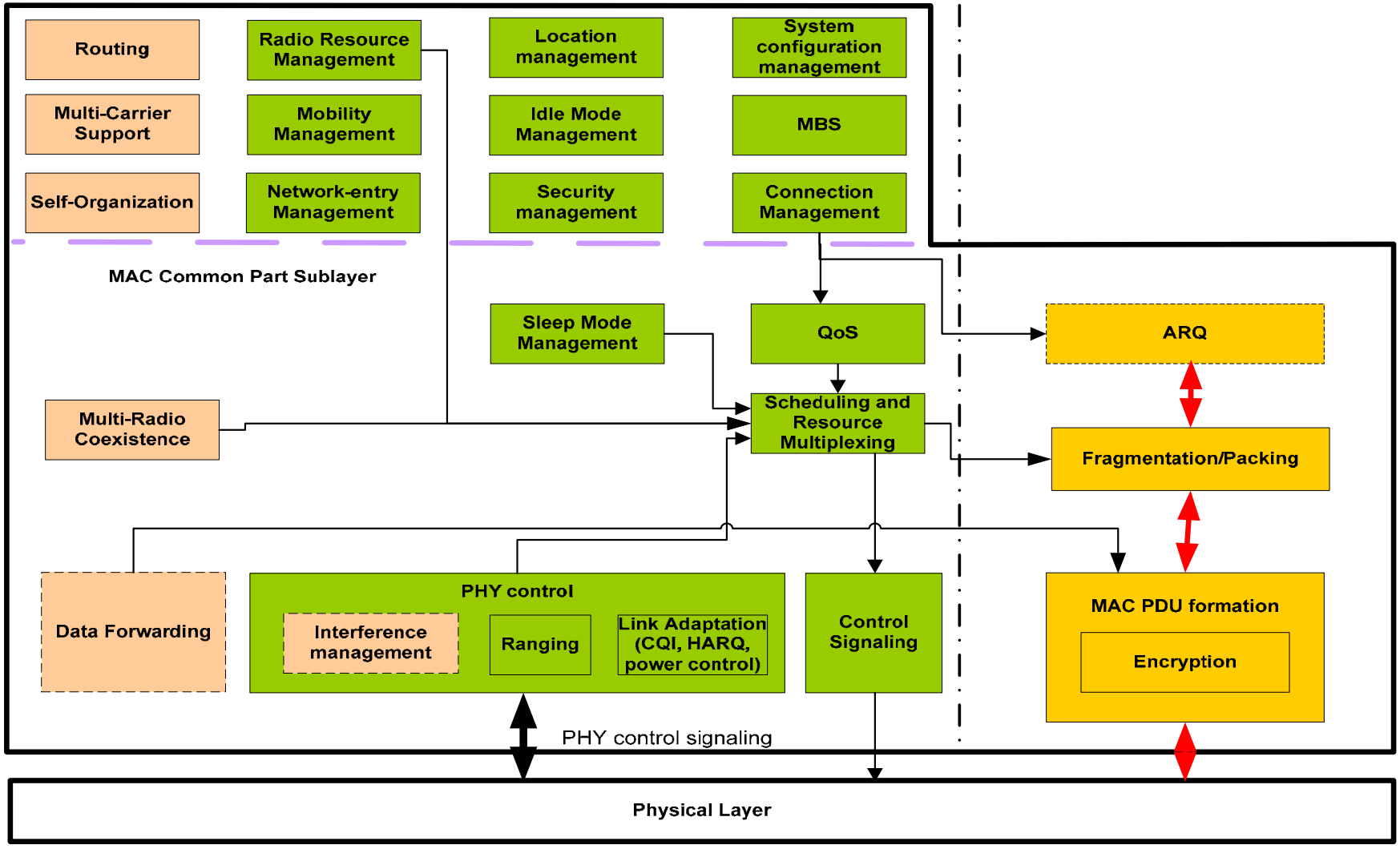
* Note that the Data Forwarding Function applies only to the BS

IEEE 802.16m Protocol Functions for Intermediate Nodes (RS)



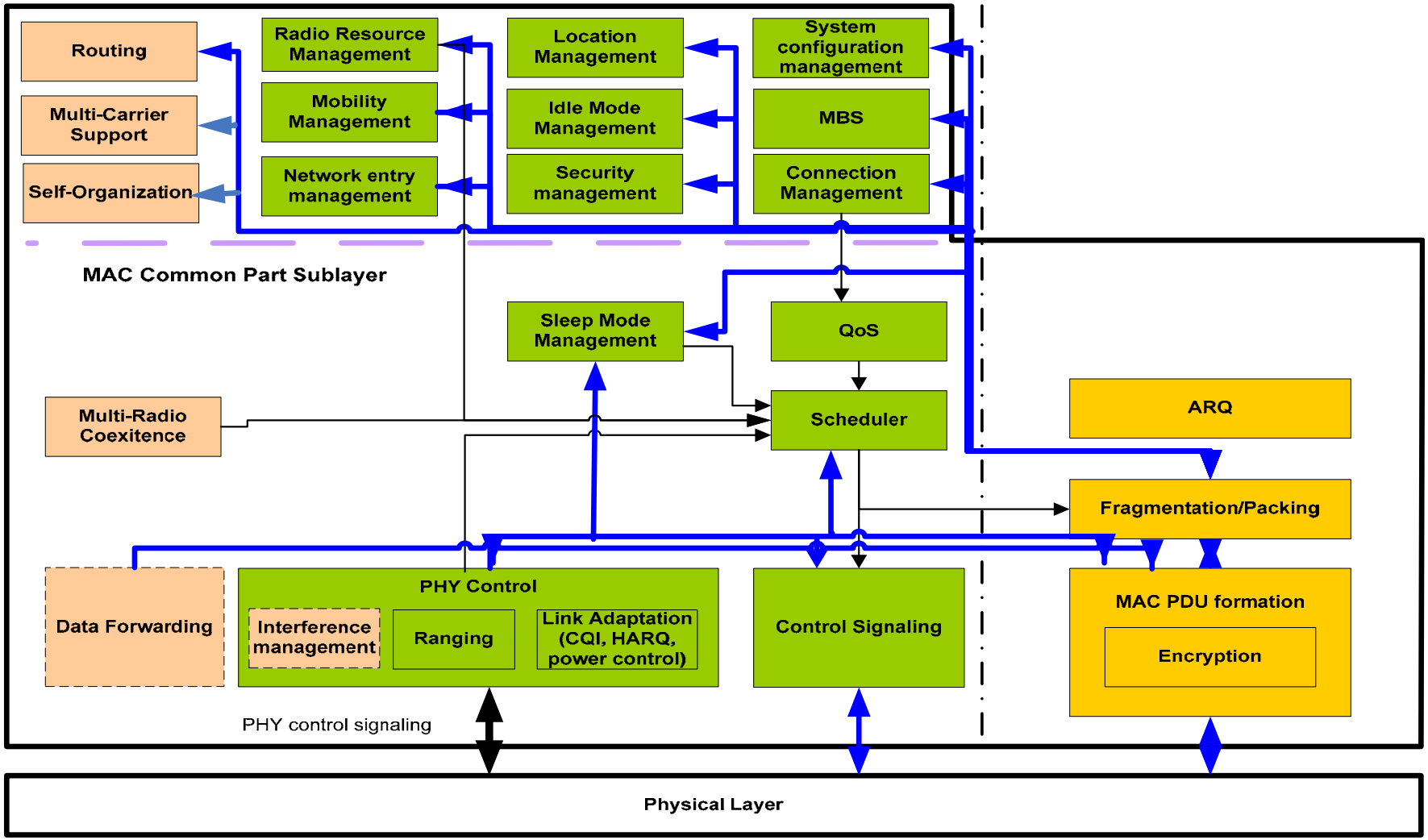
A RS contains a subset of the above-shown functions. The subset of functions depend on the RS type/category.

Data Flow for IEEE 802.16m Intermediate Nodes (RS)



A RS contains a subset of the above-shown functions. The subset of functions depend on the RS type/category.

MAC Signaling Flow for IEEE 802.16m Intermediate Nodes (RS)



A RS contains a subset of the above-shown functions. The subset of functions depend on the RS type/category.