Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: VLC cell mobility clarification
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Re:

Abstract: proposes clarification for the VLC cell mobility concept

Purpose:

Current text for architecture

A VPAN device comprises of a PHY layer, which contains the light transceiver along with its low-level control mechanism, and a MAC sublayer that provides access to the physical channel for all types of transfers. Figure 3 shows these layers in a graphical representation, which are described in more detail in 4.4.1 and 4.4.2.

The upper layers, shown in Figure 3, consist of a network layer, which provides network configuration, manipulation, and message routing, and an application layer, which provides the intended function of the device. The definition of these upper layers is outside the scope of this standard. A logical link control layer (LLC) can access the MAC sublayer through the service-specific convergence sublayer (SSCS), defined in Annex C.

Current system architecture (no mobility support)

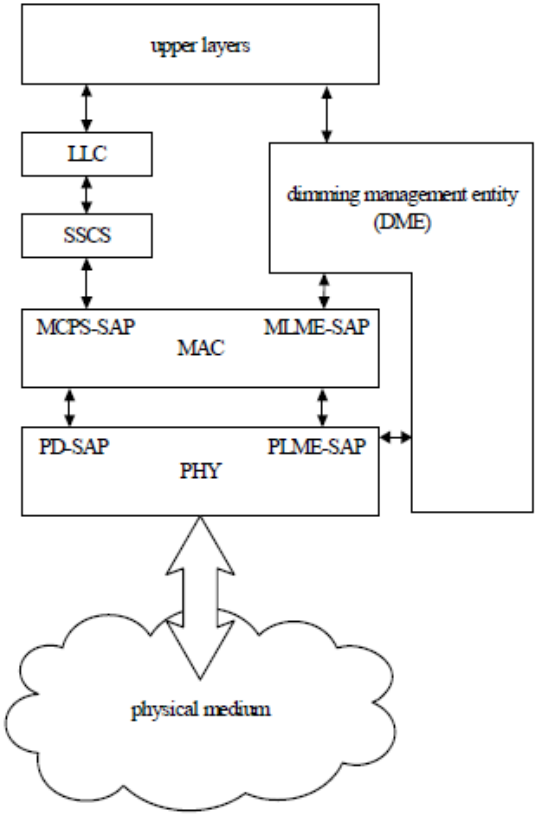
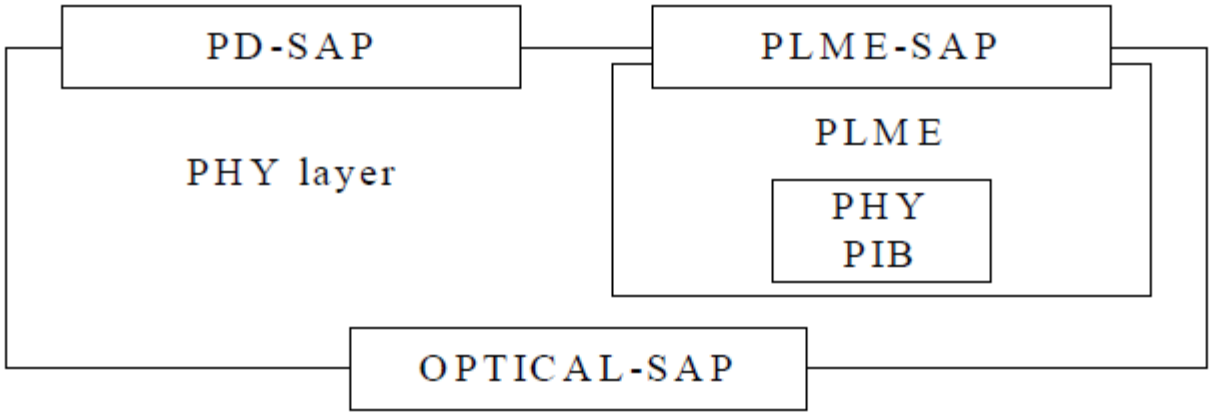
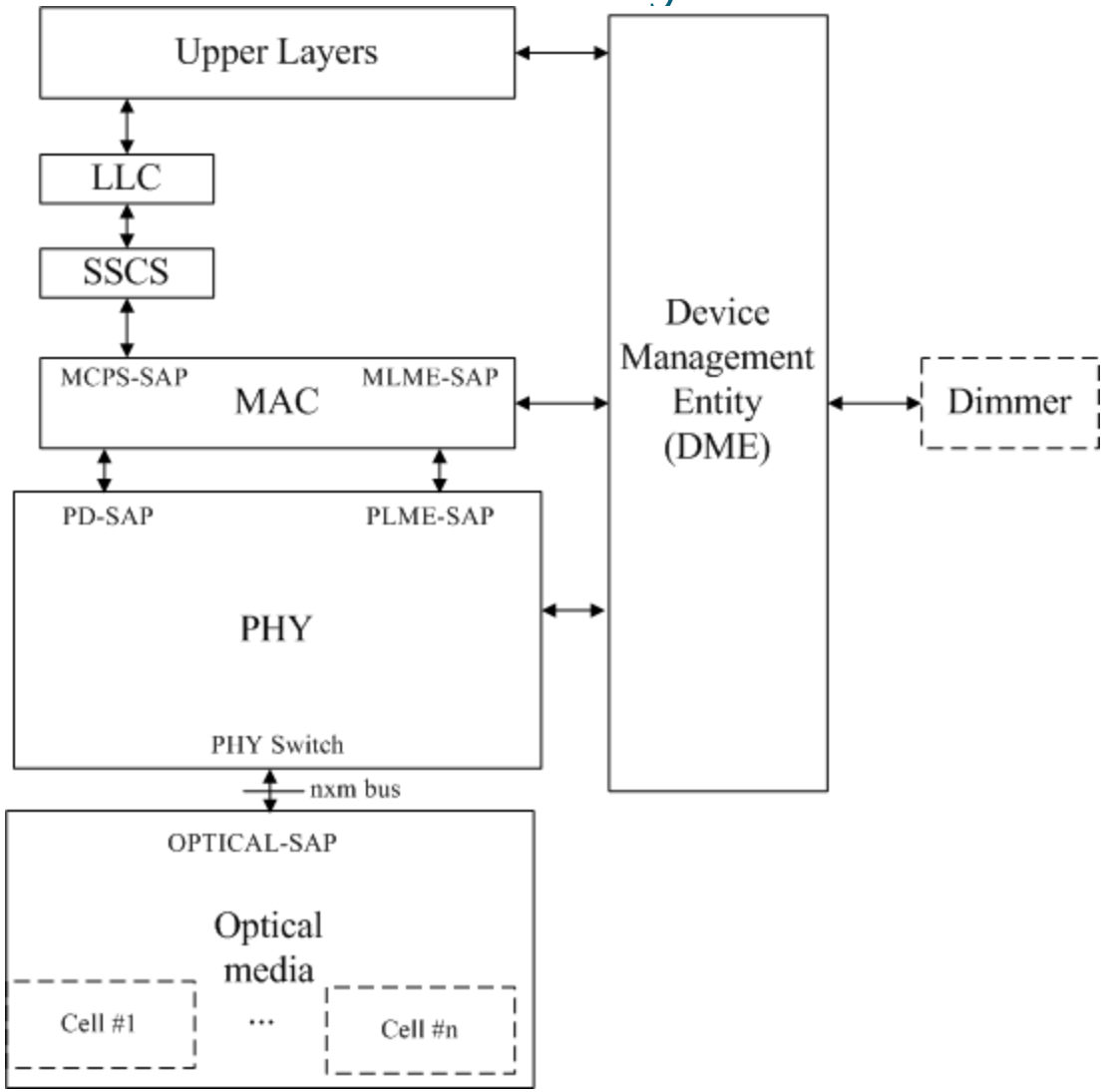


Figure 3—VPAN device architecture

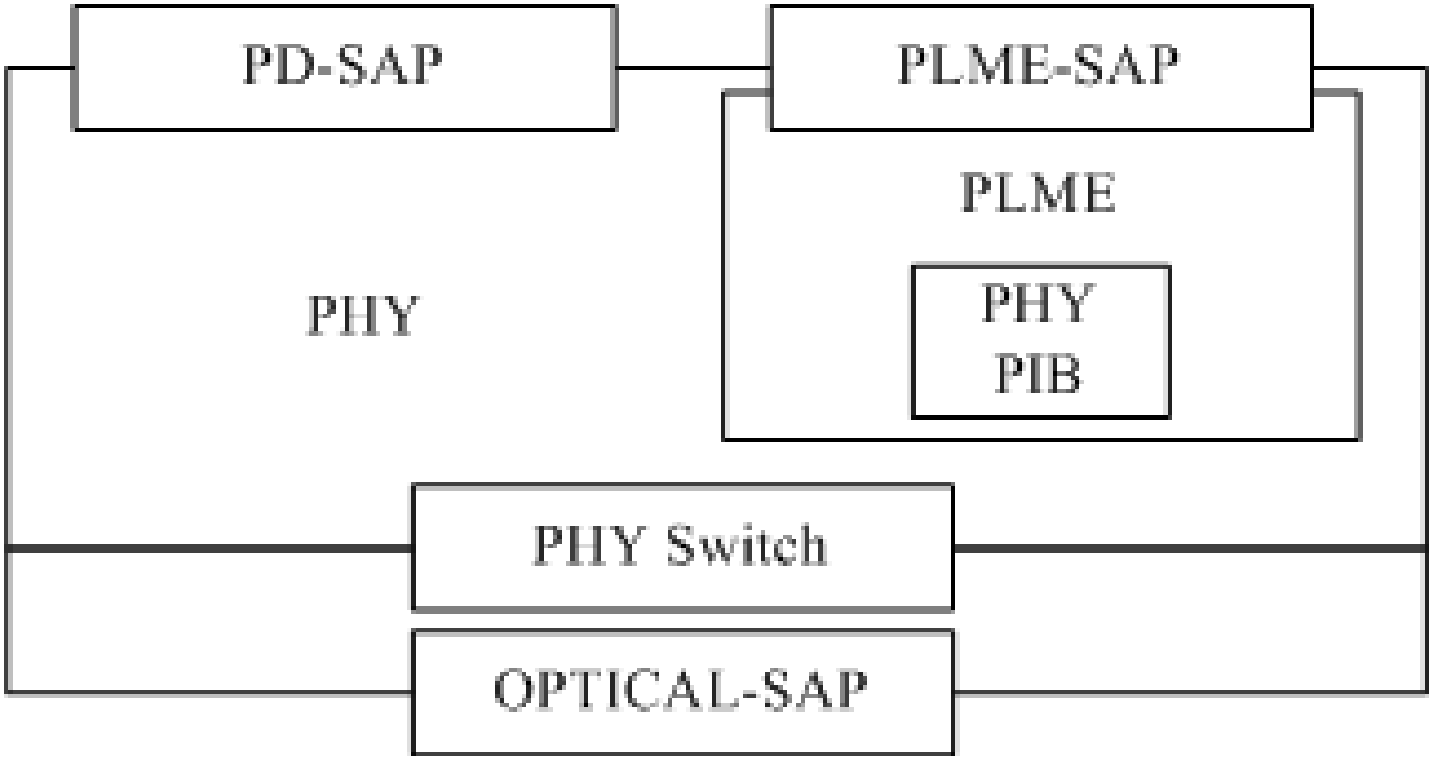
Current PHY architecture



Agreed direction for system architecture



Agreed direction for PHY architecture



Add text – PHY Switch definition

Add PHY Switch description to document

PHY Switch

- provides a transmission interface between the PHY and the optical SAP and is used to send and receive data to and from a single or multiple optical sources and photodetectors in a selective manner.

Add text - Layer partitioning

While the PHY switch is described separately as part of the PHY interface to the optical SAP, the separation is artificial, and is not meant to imply that the implementation must separate these functions. This distinction is made primarily to provide a point of reference from which to describe certain functional components and aspects of the PHY switch. For example, if only a single optical source or photodetector is used, the PHY switch may not be implemented and the PHY may interface directly to the optical SAP.

Add text - DME

"A device management entity (DME) is also supported in the architecture. The DME can talk to the PLME and MLME for the purposes of interfacing the MAC and PHY with a dimmer. The DME can access certain dimmer related attributes from the MLME and PLME in order to provide dimming information to the MAC and PHY. The DME can also talk to the PLME in order to control the PHY switch for selection of the optical sources and photodetectors. The details of the DME are outside the scope of this standard.

Add text – optical media

The PHY switch interfaces to the optical SAP and connects to the optical media, which may consist of a single or multiple optical sources and photodetectors. Multiple optical sources and photodetectors are supported in the standard for PHY III as well for VLC cell mobility. The PLME controls the PHY switch in order to select a cell, defined as a group of optical sources and photodetectors.

Cell definition (3.2) : A cell is defined as the number of optical sources or photodetectors selected by the PHY switch at a given time.

The line going to the optical SAP from the PHY switch is a vector (i.e. a bus). The number of lines in the optical SAP bus is dependent on the number of optical sources, *nxm*, being driven by the PHY, where 'n' is the number of cells and 'm' is the number of possible independent data streams from the PHY. 'm' is 1 for PHY I, II and 3 for PHY III.

PLME-SWITCH

PLME-SWITCH(SW-BIT-MAP, DIR);

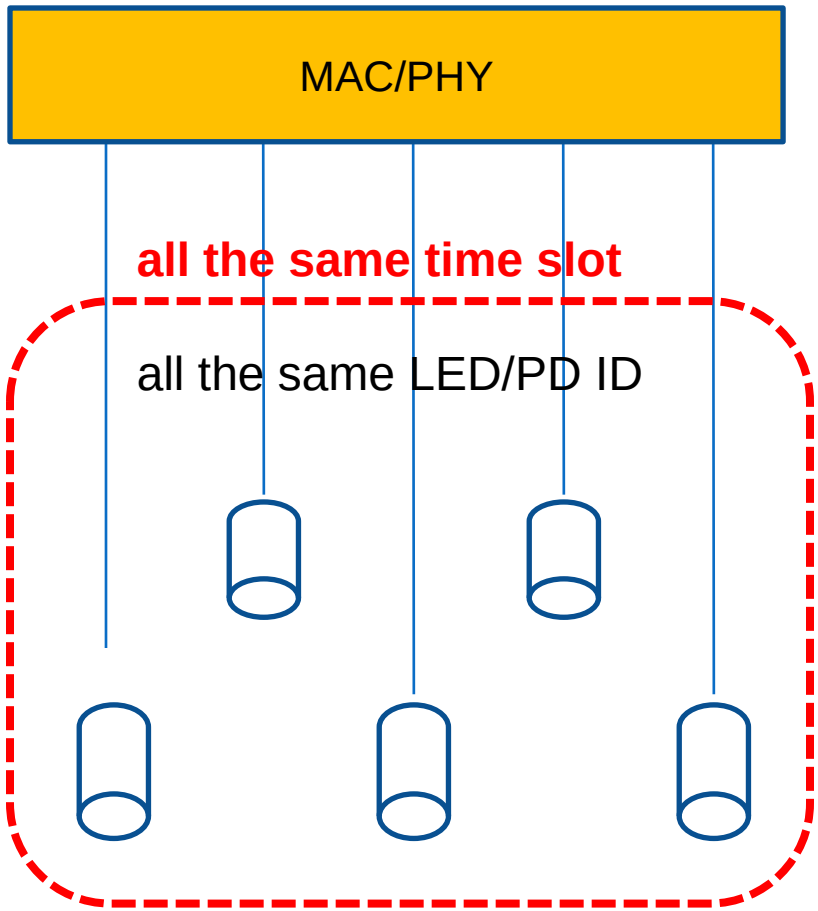
- DIR selects the switch direction based on TX or RX
- SW-BIT-MAP is a vector containing ‘n’x’m’ entries, one bit for each optical source or photodetector and is dependent on the direction. Setting the k^{th} bit to a “1” brings the corresponding optical source or photodetector into the cell group.
- The value of ‘n’ is obtained from the PHY PIB table (Table 24) and would be fetched and entered using the normal GET/SET PHY PIB primitives, shown in subclause 5.2.2.
- ‘m’ is 1 for PHY I, II and 3 for PHY III.

Functionality#1 – Static

MAC : same ID assignment and time slot assignment

Static mode

(no mobility)

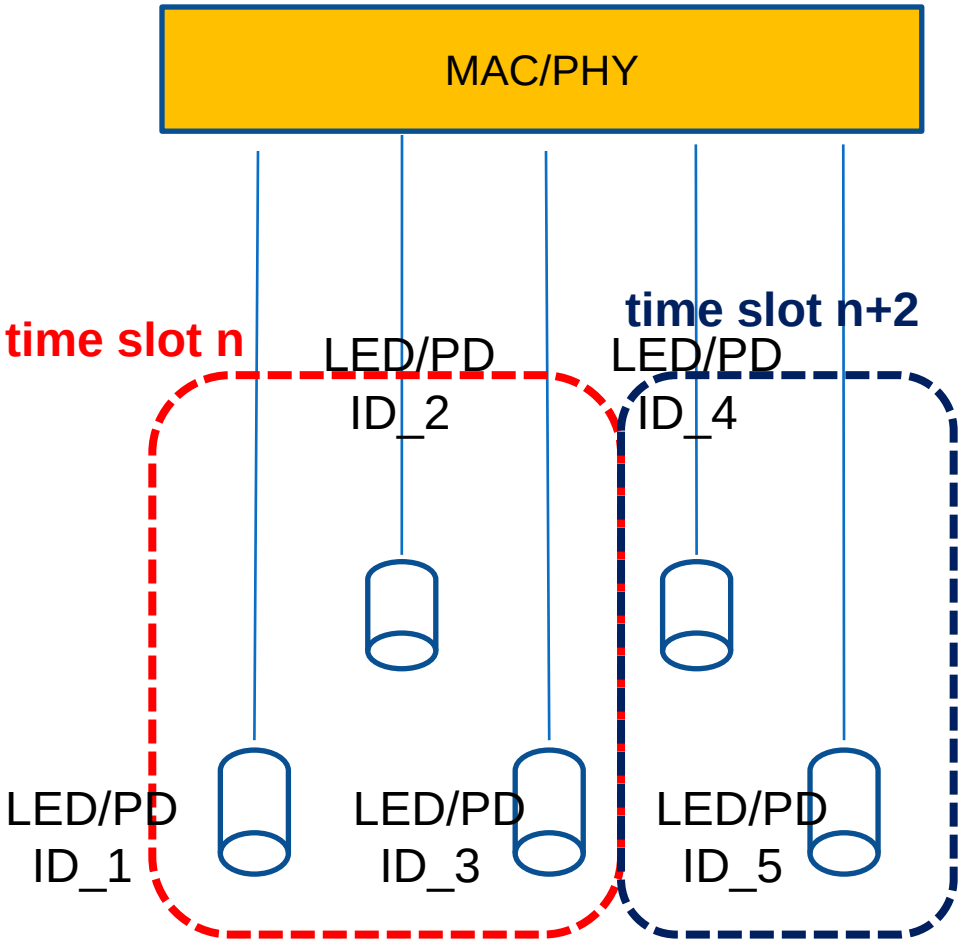


Functionality#2 - Dynamic

MAC : time slot assignment based on ID

Dynamic mode (mobility) based on grouping

- All PHYs within a group operate in the same manner
- Group size can be varied
- **Only one group active at a time for VLC communication**



This model is similar to model #2 in doc 10/687r0

The PHY switch is part of the PMD and is controlled by the DME. The cell IDs are used to select the subset of PHYs to be used for communication. The other PHYs that are not used for communication are simply providing illumination. The design of the PMD is left to the implementer.

Single MAC frames can be routed to/from any combination of PHYs