

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

Submission Title: [VLC MAC Considerations]

Date Submitted: [11 September, 2008]

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Abstract: [This document presents VLC MAC Considerations]

Purpose: [To PAR/5C discussion on the protocol requirements for VLC PHY/MAC]

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VLC MAC considerations

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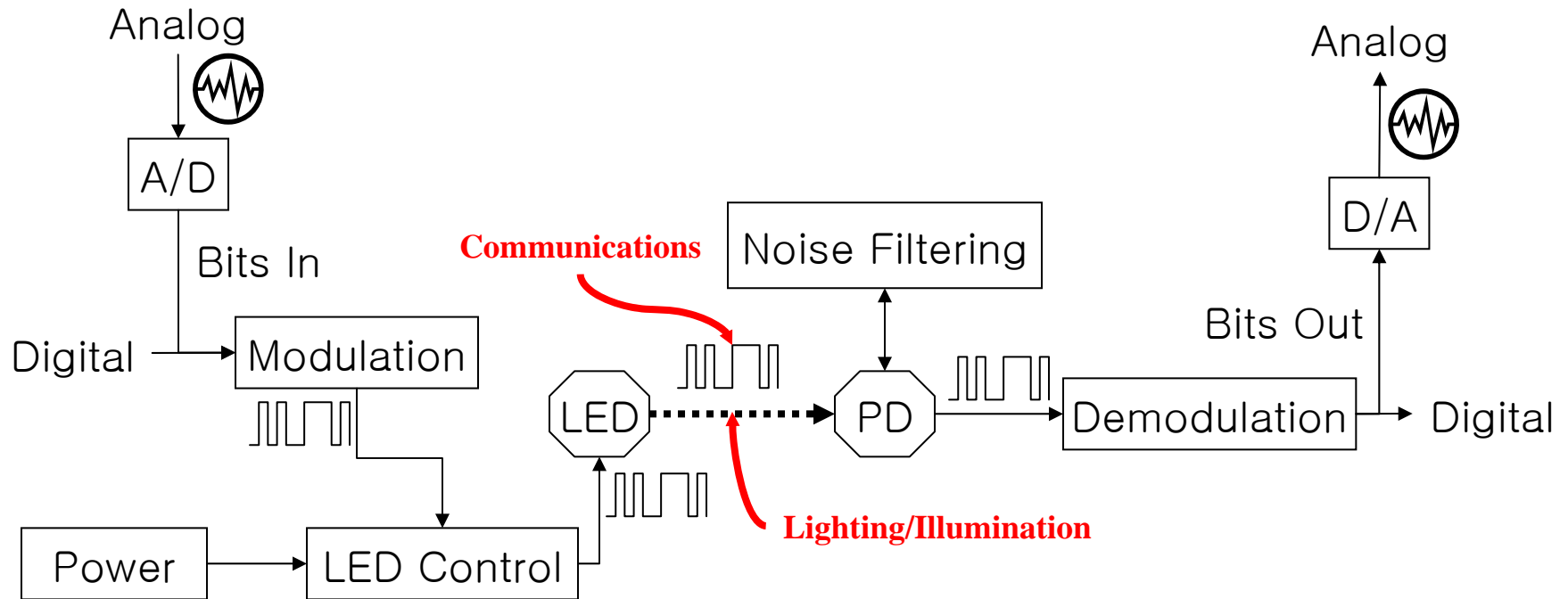
VLC Basic Considerations

- Co-operations with LED illumination
 - Modulation's side effects
- Light Color communication
 - Multi channels
- LED Compatibility
 - LED Interfaces with illumination
- Light Interference Robustness
 - Light interferences among many different lights

VLC Basic Principle

VLC Sending Part

VLC Receiving Part



VLC Key Part considerations

- Sending Part
 - LED standard interface
 - Illumination/transmission performance
- Receiving Part
 - PD standard interface
 - Avoidance from any other light interference
- Common Part
 - VLC PHY
 - VLC MAC
 - VLC Architecture

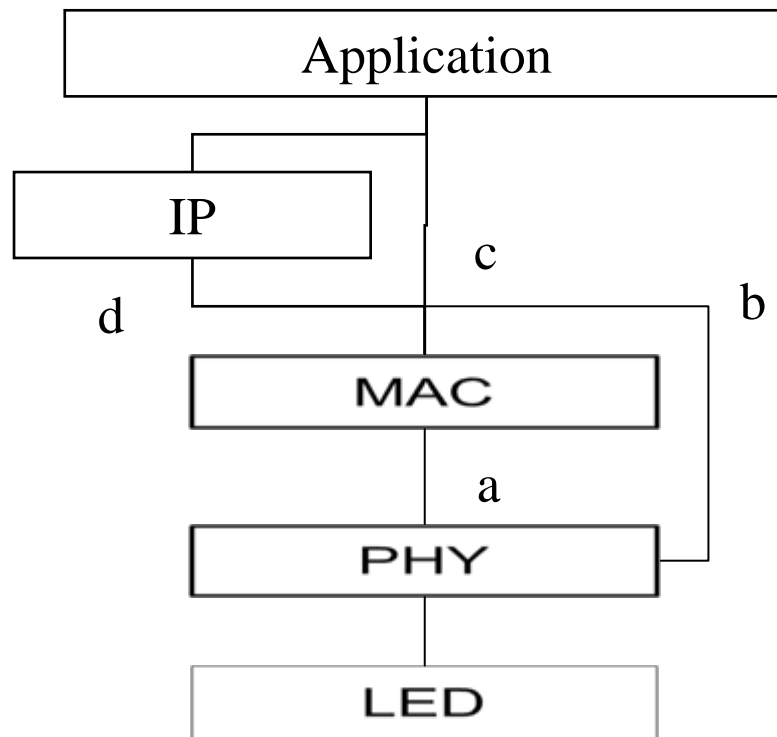
VLC MAC Basic Functions

- MAC PDU format
- MAC header formats
- MAC Management messages
- Error recovery mechanism
- LED illumination management
- VLC Application support mechanism

MAC Requirements

- Distance/Area in terms of light reach/view
 - Long Range
 - Short Range
- Performance
 - Multiple channels
 - One-way/two-way
 - Symmetry/asymmetry speed
- Applications
 - Lighting communications
 - Infrastructure mode/Peer-to-peer mode
 - ITS, LBS, Machine-to-Machine, Sensor, and so on.

VLC MAC Protocol Stack Relations



VLC MAC Interfaces

- Interface a
 - MAC-PHY
- Interface b
 - PHY-Application (without MAC)
- Interface c
 - MAC - Application
- Interface d
 - MAC - IP

Interface a

- MAC-PHY interface
 - Media Access Control to Physical Layer
- Functions
 - MAC Addressing mechanism
 - Channel access control mechanism
 - Error recovery
- Applications
 - Services with IP
 - Services without IP

Interface b

- PHY-Application (without MAC)
 - Physical layer to application layer
- Functions
 - straight forward data transfer to application layer
 - Application specific functions
- Applications
 - Simple data transfer without logical channel
 - Analog data transfer

Interface c

- MAC – Application
 - MAC to Application layer
- Functions
 - Handling logical channels
 - Media data transfer without routing
- Applications
 - Stand alone data communication service
 - Machine to Machine service

Interface d

- MAC – IP
 - MAC to IP
- Functions
 - Addressing for routing
 - Media data transfer format for routing
- Applications
 - data communication service with IP
 - End-to-end or client-server service through network

Dimming consideration

- Modulation : Dimming
 - Some modulations make a side effect to the illumination brightness due to off time
- Relationship considerations
 - Speed
 - BER
 - Illumination

Color Considerations

- Channels choice according to a color
 - R(Red)
 - G(Green)
 - B(Blue)
- Color Spectrum Standard
 - Boundary: From – to
- Color channel management

Light Interference Consideration

- Light noises
 - Sun light
 - Illumination from others
 - Reflection light
- Considerations
 - Noise Echo Cancellation
 - Avoid noise

Error Recovery Consideration

- Errors
 - Long distance
 - Fog/heavy rain
 - Obstacle Swing
- Considerations
 - Strong Error Recovery function
 - No Error Recovery function

Conclusions : VLC MAC features

- Color communication
 - Color channel handling service
 - SIMO, MISO, MIMO
 - Channel status as same as illumination status
- LED Compatibility
 - LED Interfaces with illumination
 - Dimming considerations
- Light Interference Robustness
 - Light interferences among many different lights
 - Error Recovery mechanism