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

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Abstract: [This document presents about selection of VLC Applications]

Purpose: [To make a contribution for IEEE 802.15.7 VLC standard]

Selection of VLC Applications

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- Application selection according to data rate and distance
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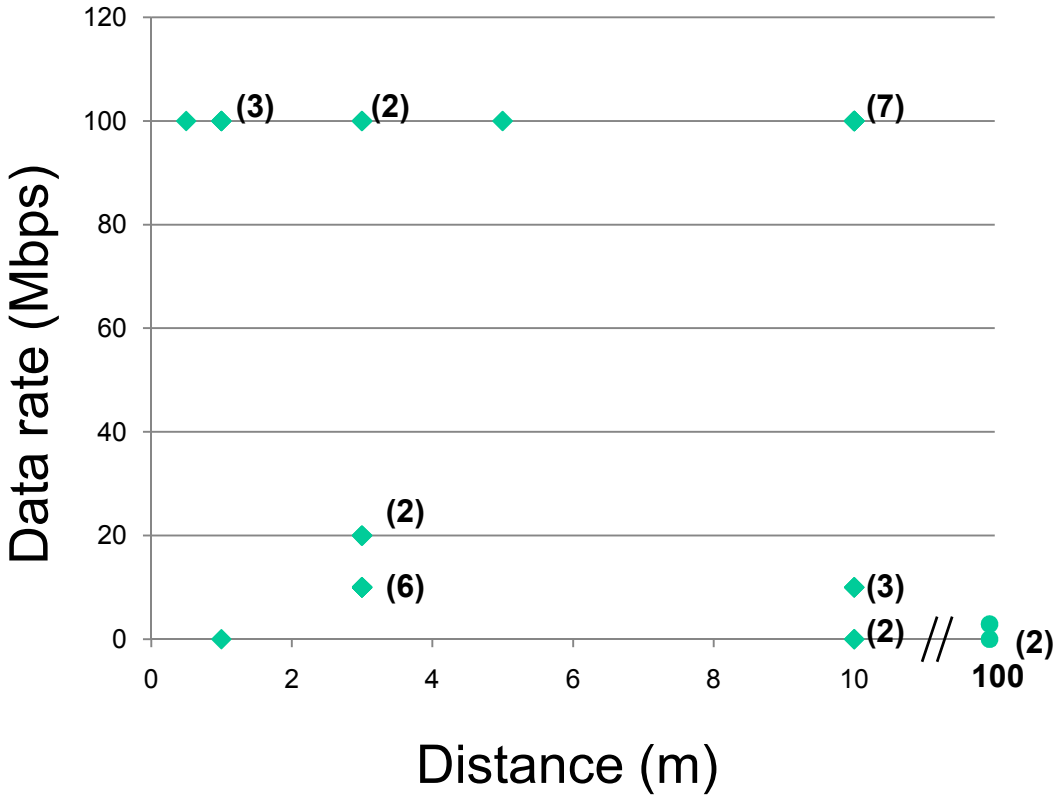
Motivation

- Too many application
  - 37 applications
- Too wide requirement
  - 10kbps to 100Mbps data rate
  - 50cm to 100m distance
- Do we have to cover all applications and requirements?

Application distribution



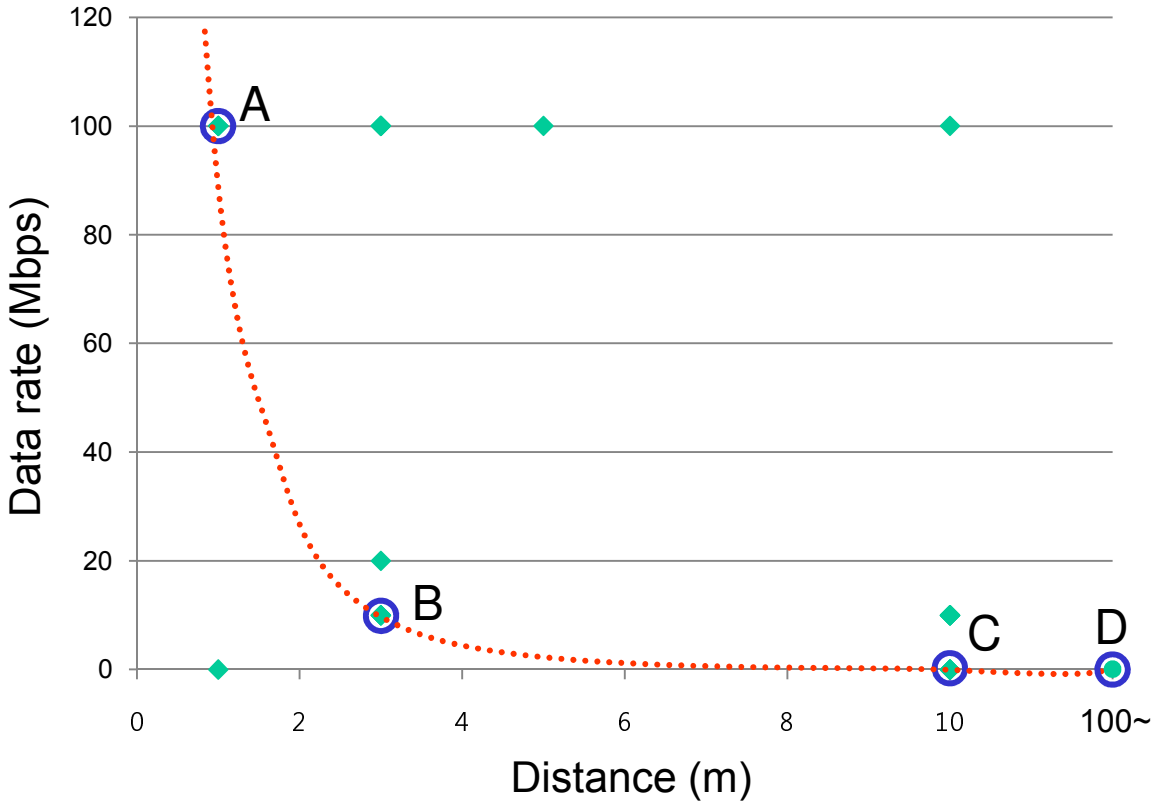
- Too various Data rate and Distance
- No relation between data rate and distance
- Need to minimize

- (n) : number of application
- Maximum data rate and distance

Application selection criterion

- Distance vs. Data rate
  - Received power is reduced by inverse square law according to the distance increase
  - Short range high data rate
  - Long range low data rate
- Acceptable data rate and distance

Application Selection - Data rate (uplink) and Distance

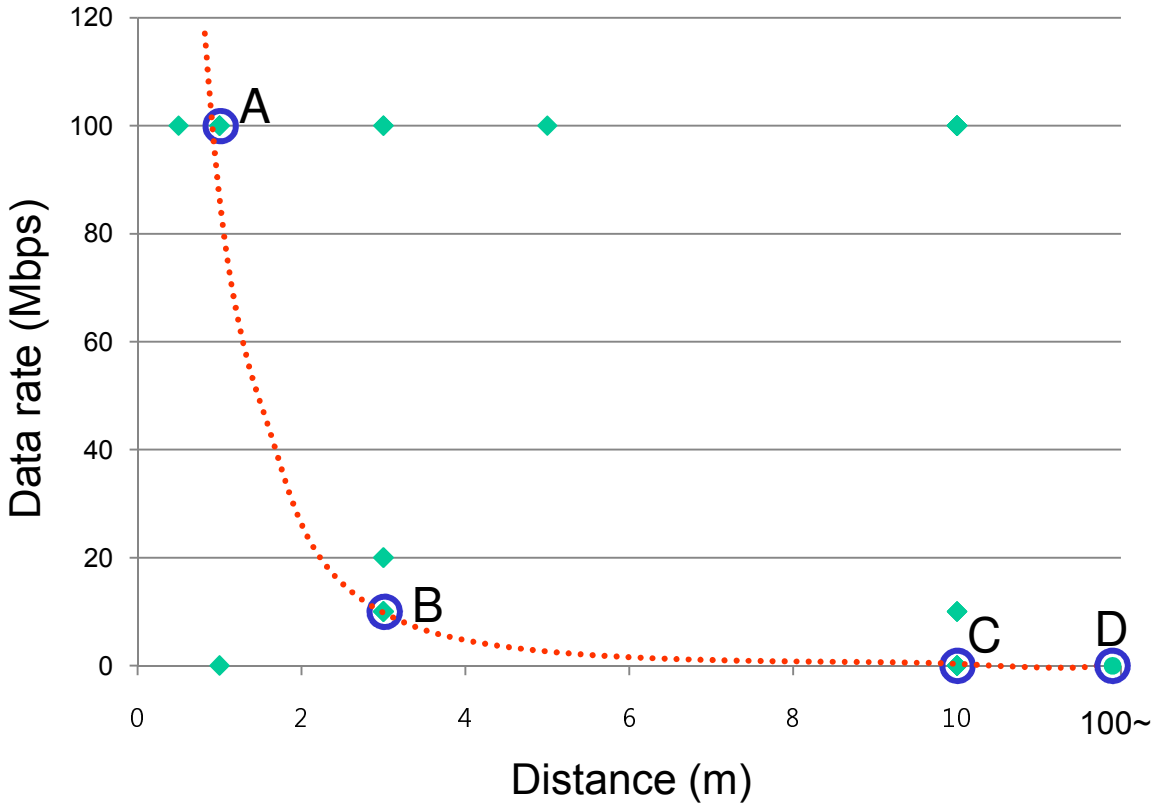


- A
  - 100Mbps
  - 1m
- B
  - 10Mbps
  - 3m
- C
  - 10kbps
  - 10m
- D
  - 100kbps
  - 100m

Selected Application list - uplink data rate and distance

- A : 100Mbps/1m
  - Mobile to Mobile, Point and sending large data
  - Mobile to fixed (10~100Mbps)
- B : 10Mbps/3m
  - Fixed to infrastructure, Signboard to ITS,
  - Short range High Speed, Visible LAN (mobile to infra)
  - Indoor navigation Bi-direction down link
- C : 10kbps/10m
  - Visual remote control
  - E-commerce
- D : 100kbps/100m
  - Vehicle to vehicle/infrastructure

Application Selection - Data rate (downlink) and Distance



- A
  - 100Mbps
  - 1m
- B
  - 10Mbps
  - 3m
- C
  - 10kbps
  - 10m
- D
  - 100kbps
  - 100m

Selected Application list - downlink data rate and distance

- A : 100Mbps/1m
  - Mobile to Mobile, Point and sending large data
  - Electric contents Vending Machine(~0.5m)
  - Mobile to fixed (10~100Mbps)
- B : 10Mbps/3m
  - Fixed to infrastructure, Signboard to ITS,
  - Short range High Speed, Visible LAN (mobile to infra)
  - Indoor navigation Bi-direction down link
  - Information or guidance service
- C : 10kbps/10m
  - Indoor navigation: send the lamp ID only
  - E-commerce
- D : 100kbps/100m
  - Vehicle to vehicle/infrastructure

Result of Application selection

- 100Mbps (1m)
  - Mobile to Mobile(~1m)
  - Point and sending large data(~1m)
  - Electric contents Vending Machine(~0.5m)
  - Mobile to fixed (10~100Mbps)
- 10Mbps (3m)
  - Fixed to infrastructure, Signboard to ITS,
  - Short range High Speed, Visible LAN (~3m)
  - Information or guidance service(~3m)
- 100kbps (100m)
  - Vehicle to vehicle/infrastructure
- 10kbps (10m)
  - Visual remote control(~10m)
  - Indoor navigation: send the lamp ID only(~10m)
  - E-commerce(1m)

Definition of Distance and Data rate

- Distance
  - Short range: device with expected operational range <= 3 m.
  - Long range: device with expected operational range > 3 m.
- Data Rate
  - Low data rate: PHY data rate < 1 Mbps
  - High data rate: PHY data rate >= 1 Mbps
- Assign Distance at Date rate
  - Short range at High data rate
  - Long range at Low data rate
  - 3m at 1Mbps

Data rate & distance rearrange – short range high data rate

- 100Mbps (~0.5m)
  - Mobile to Mobile (~1m)
  - Point and sending large data (~1m)
  - Electric contents Vending Machine
  - Mobile to fixed
- 10Mbps (~1m)
  - Visible LAN (~3m)
  - Information or guidance service(~3m)
  - Mobile to fixed
- 1Mbps (~3m)
  - Base Data Rate for High Speed
  - Some possible application

Data rate & distance rearrange – long range low data rate

- 100kbps (3m~)
  - Indoor navigation: send the lamp ID only (10kbps)
  - E-commerce (10kbps)
- 10kbps (10m~)
  - Visual remote control (3m)
  - Base Data Rate for Low Speed

Conclusions

- Too many applications/wide requirements
- Propose the base data rate
  - 1Mbps for short range high data rate
  - 10kbps for long range low data rate
- Do we have to cover all applications and requirements?