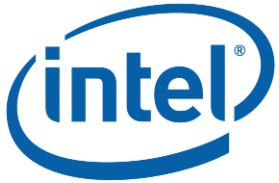


Intel Labs presentation for

UC-Light Center kickoff meeting

January 26th, 2010

Rick Roberts, Intel Labs Researcher

IEEE802.15.7

Visible Light Communications

IEEE802.15.7 started in early 2008

Application use cases vary …

- Vehicular centric
  - ✓ Infrastructure to car
  - ✓ Car to car
- Point-to-point
- Point-to-multi-point
- Visible light area networking

Summary of 802.15.7 draft text

1. Several PHY types
   - Low rate PHY (~100 Kbps)
     - longer range (i.e. automotive)
   - Medium rate PHY (~ 5 Mbps)
   - High rate PHY (>10 Mbps)
     - multiple bits/symbol (color shift keying)

2. One common MAC
   - Several different topologies
     - Star, point-to-point
   - Hybrid Superframe
     - Contention free slots
     - Contention slots
   - Security

Summary of 802.15.7 draft text

- Support light dimming during data transmission
- Support for flicker compensation
  - Intra-frame flicker
    - via use of Run Length Limited Coding
  - Inter-frame flicker
    - via use of “visibility idle patterns”

Will IEEE802.15.7 be the definitive VLC standard?

- The success of 802.15.7 remains to be seen
- IEEE802.15.7 needs wider participation by the LED lighting ecosystem companies

Visible Light Communications

Some thoughts at Intel Labs

When do we need a VLC standard?

We need a standard for applications when equipment comes from multiple vendors and is required to interoperate.

An example is “smart sign” information broadcast where broadcasts from a manufacturer’s sign (i.e. safety infrastructure) would be expected to be successfully received by mobile handsets from multiple vendors.

Prototype made by The Nippon Signal Co., Ltd., JAPAN SHOP 2006

VLC and a "unique" solution space

A significant enabler for the market success of VLC is a "unique" solution space where VLC can "do something" in an optimal manner when compared with other wireless solutions.

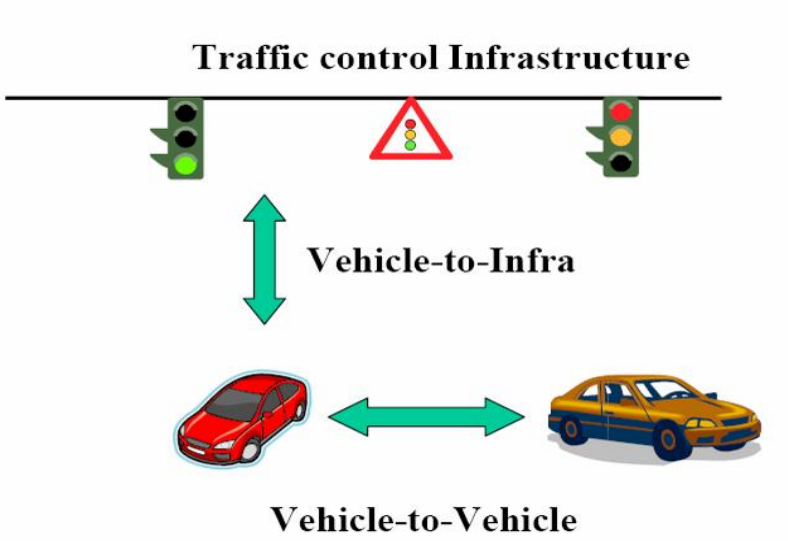
Trying to position VLC towards applications that are already adequately served with existing wireless (e.g. WiFi) may be problematic.

For example: changing WLAN → VLAN … why? WiFi is ubiquitous in devices anyways!

Caution – the allure of "more bit rate"

It seems much VLC research is targeted towards increasing the bit rate. While I'm not against "going faster", I think there is a significant market in sending data "fast enough" but at low cost with high data integrity (i.e. robust).

Intel Labs is particularly enthralled by the use of VLC in the smart traffic infrastructure.



What kind of research needs to be done to make Intelligent Traffic Systems a reality?

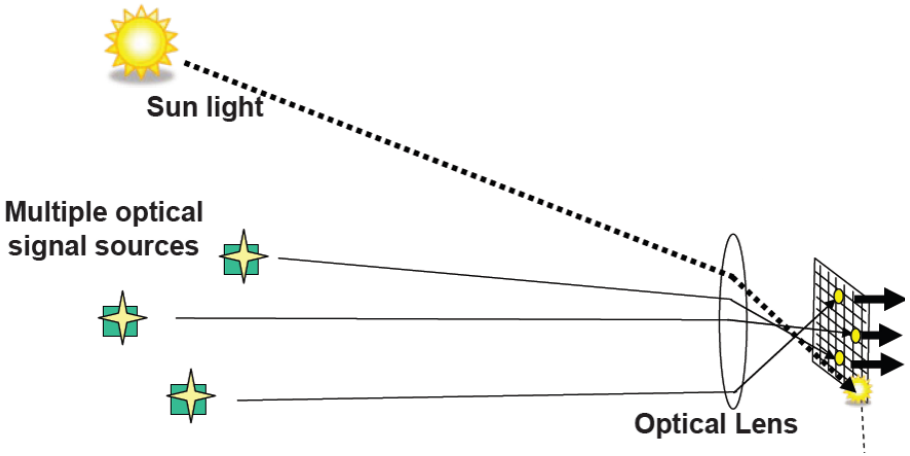
- Performance of a digital comms link is determined by Eb/No

  ✓ Much VLC work done on determining Eb
  - (i.e. propagation modeling)

  ✓ But more work needs to be done on determining No
  - *Background noise in different deployment environments*
  - *Additive noise from difference hardware topologies*

What kind of research needs to be done to make Intelligent Traffic Systems a reality?

- Device discovery at high rates of mobility, while still supporting spatial multiplexing, is another interesting research topic.



The End