Transmission of IPv6 Packets over Short-Range Optical Wireless Communications (IPv6 over OWC)

draft-choi-6lo-owc-02

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Status of “IPv6 over OWC”

• draft-choi-6lo-owc-00 (IETF 117, San Francisco, July 2023)
  - The Introduction to the new I.D., IPv6 over OWC

• draft-choi-6lo-owc-01 (IETF 118, Prague, November 2023)
  - Revision addressing technical issues related to IPv6 over OWC

• draft-choi-6lo-owc-02 (IETF 119, Brisbane, March 2024)
  - Revision incorporating comments from IETF118
  - Addition of SCHC in IPv6 over OWC
Ref.#1: Short-Range Optical Wireless Communications (OWC) ?

- **OWC** uses *intensity modulation of optical sources*, such as Light Emitting Diodes (LEDs).

- **OWC** combines lighting and *bidirectional data communications*.

- **OWC** can be finding applications in various domains including area *lighting, signboards, streetlights, vehicles, traffic signals, displays, LED panels, and digital signage, smart phones ...*

- **OWC** devices can be powered by *limited energy sources* (e.g., battery or energy harvesting) for energy-efficient services.
Ref.#2: OWC v.s. IEEE 802.15.7

• OWC is defined by IEEE 802.15.7 standard providing 6 characteristics, such as

Visible Light Communication (VLC),
Short-Range Bidirectional Communication,
Line-of-Sight (LOS) & Non-Line-of-Sight (NLOS) Support,
High and Low Data Rates,
Energy Efficiency,
and Secure Communication.
Updates btw -01 v.s. -02
Comment in IETF 118  
- #1: “Explicitly state how to get bidirectional” by Esko

1. Introduction

The rapid growth of the Internet of Things (IoT) has led to a significant increase in the number of wireless communication technologies utilized for real-time data collection and monitoring in various industrial domains, such as manufacturing, agriculture, healthcare, transportation, and so on. This trend highlights the importance of wireless communication in facilitating real-time data exchange and analysis, ultimately contributing to enhanced operational efficiency and decision-making processes across different industrial sectors.

Optical Wireless Communications (OWC) is one of the candidates for IoT wireless communication technologies, which are utilized in various industrial sectors. OWC is specified in the IEEE 802.15.7 [IEEE802.15.7]. IEEE 802.15.7 defines an OWC standard that provides characteristics such as Visible Light Communication (VLC), Short-Range Communication, Line-of-Sight (LOS) and Non-Line-of-Sight (NLOS) Support, High and Low Data Rates, Energy Efficiency, and Secure Communication.

OWC has potential to support IPv6-based IoT networking as one of the low-power wireless personal network (LoWPAN) technologies. OWC
### Comment in IETF 118
- #2: “Consider whether Path MTU discovery is needed” by Pascal

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<td><strong>The 2nd sentence will be removed in the next version.</strong></td>
<td><strong>Even though OWC devices have larger MTUs (i.e., PHY2 and PHY3) than 1280 octets, use of a 1280-octet MTU is RECOMMENDED in order to avoid need for Path MTU discovery procedures [RFC7668]. However, for communication between an OWC device and other non-OWC devices on the Internet, probably the MTU is 1280 bytes (for the devices on the Internet) and Path MTU discovery [RFC8201] would be needed.</strong></td>
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4.7. Unicast and Multicast Address Mapping

The address resolution procedure for mapping IPv6 non-multicast addresses into OWC Link-Layer Addresses follows the general description in Sections 4.6.1 and 7.2 of [RFC4861], unless otherwise specified.
Addition about SCHC
- SCHC in IPv6 over OWC (Further considerations required)

4.6. Fragmentation and Reassembly Considerations

For PHY1 of OWC, IPv6 over OWC MUST use [RFC4944] Fragmentation and Reassembly (FAR). The MTU of OWC PHY1 is smaller than the MTU of IPv6 Packet (1280 bytes). However, because the MTU of OWC PHY2 and PHY3 are bigger than MTU of IPv6 Packet, IPv6 over OWC MUST NOT use [RFC4944] FAR at the adaptation layer for the payloads as discussed in Section 3.4.

In addition, OWC devices MAY utilize a mechanism for header compressed by Static Context Header Compression and fragmentation (SCHC) [RFC8724] if SCHC-compressed header is required. For instance, SCHC may be used not only for UDP header compression, but for IPv6 headers, IPv6/UDP headers, or even IPv6/UDP/CoAP if CoAP is used (e.g., as in the SCHC HC over 802.15.4)
Concluding remarks

• The 3rd Individual I.D., “draft-choi-6lo-owc-02” for IPv6 over OWC: revised for comments in IETF118 & SCHC in IPv6 over OWC

• We would like to ask for “WG-draft adoption” of 6lo WG: in IETF 119 (Brisbane, March 2024)

• Please read the draft and welcome to any feedback !!
Ref.#3: Test-bed for “IPv6 over OWC”
Ref.#4: Test Results of “IPv6 over OWC”

- Ping responses
- Wireshark captured

![Ping results and Wireshark capture](image-url)
Ref.#5: IEEE WCL about “IPv6 over OWC”