

IPv6 over Constrained Node Networks(6lo) Applicability & Use cases

draft-ietf-6lo-use-cases-08

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History and status

- WG document : draft-ietf-6lo-use-cases-00 (Nov.2.2016)
- 7th revision : draft-ietf-6lo-use-cases-07 (Sep.10.2019)
- 8th revision : draft-ietf-6lo-use-cases-07 (Nov.04.2019)

Goal of this document:

Help 6lo/6lowpan stack adaptation by a L2-constrained technology and help a newcomer understand how 6lowpan stack can be applicable in practice. Useful for new adopters of IOT@IETF.

6lo Link layer technologies

- ITU-T G.9959 (Z-wave) : RFC 7428
- Bluetooth Low Energy : RFC 7668
- DECT-ULE : RFC 8105
- Master-Slave/Token-Passing : RFC 8163
- NFC : draft-ietf-6lo-nfc-15
- PLC : draft-ietf-6lo-plc-01
- IEEE 802.15.4e : RFC 7554

Comparison across 6lo Link layer tech.

	Z-Wave	BLE	DECT-ULE	MS/TP	NFC	PLC	TSCH
Usage	Home Automation	Interaction with Smart phone	Meter Reading	Building Automation	Health care Services	Smart Grid	Industrial Automation
Technology & Subnet	L2-mesh or L3-mesh	Star Mesh	Star No mesh	MS/TP No mesh	P2P L2-mesh	Star, Tree, Mesh	Mesh
Mobility Reqmt	No	Low	No	No	Moderate	No	No
Security Reqmt	High, Privacy required	Partially	High, Privacy required	High, Authen. required	High	High, Encrypt. required	High, Privacy required
Buffering Reqmt	Low	Low	Low	Low	Low	Low	Low
Latency, QoS Reqmt	High	Low	Low	High	High	Low	High
Date Rate	Infrequent	Infrequent	Infrequent	Frequent	Small	Infrequent	Infrequent
RFC # or Draft	RFC 7428	RFC 7668	RFC 8105	RFC 8163	draft-6lo-nfc	draft-6lo-plc	RFC 7554

6lo Deployment Scenarios

- jupitermesh in Smart Grid using 6lo in network layer
- Wi-SUN usage of 6lo stacks
- G3-PLC usage of 6lo in network layer
- Netricity usage of 6lo in network layer

Guidelines for adopting IPv6 stack (6lo/6LoWPAN)

–The modification of 6LoWPAN stack should be based on :

- Addressing Model
- MTU Considerations
- Mesh or L3-Routing
- Address Assignment
- Header Compression
- Security and Encryption
- Additional processing

6Lo use cases (1/2)

- Use case of ITU-T G.9959: Smart Home
 - Example: Use of ITU-T G.9959 for Home Automation
- Use case of Bluetooth LE: Smartphone-Based Interaction
 - Example: Use of Bluetooth LE-based Body Area Network for fitness
- Use case of DECT-ULE: Smart Home
 - Example: use of DECT-ULE for Smart Metering
- Use case of MS/TP: Building Automation Networks
 - Example: Use of 6LoBAC in Building Automation Networks

6lo use cases (2/2)

- Use case of NFC: Alternative Secure Transfer
 - Example: Use of NFC for Secure Transfer in Healthcare Services with Tele-Assistance
- Use case of PLC: Smart Grid
 - Example: Use of PLC for Advanced Metering Infrastructure
 - Example: Use of PLC (IEEE1901.1) for WASA in Smart Grid
- Use case of IEEE 802.15.4e: Industrial Automation
 - Use of IEEE 802.15.4e for P2P communication in closed-loop application

Comments & Email discussion

- Comments in last meeting : Adjust the scope
 - Narrow down and focus
 - Make consistency between each section
- Email discussion btw authors : Determine 6lo technologies
 - LPWAN related technologies are out of scope
 - LTE MTC is removed
 - Focus on technologies that have been handled after 802.15.4
 - Other technologies which are not related to RFCs or WG documents are out of scope
 - draft-delcarpio-6lo-wlanah-01
- Comments from Pascal and Liubing (Remy)

Update after IETF105 (1/3) (Discussion btw authors)

- Remove related parts with IEEE 802.15.4 and IEEE 802.15.4e
 - Section 3.7, 4.1, 4.2, and A.6 in previous draft are removed
 - Update Table 2, Comparing between 6lo link layer technologies
- Rename of the title of section 3 to “6lo Link layer technologies”
 - Remove “specified” expression
- Remove “specified” from the subsection titles in section 3
- Reduce section 5 to only include section 5.2 and rename of the title to “Guidelines for adopting IPv6 stack (6lo/6LoWPAN)”
- Move original contents of section 5.1 (Design Space Dimensions for 6lo Deployment) into Appendix
- Move other 6lo use cases examples in Appendix A into Section 6.

Update after IETF105 (2/3) (Comments from Pascal)

- Reword to “IEEE Std 802.15.4” and include a reference

[IEEE802154]

IEEE standard for Information Technology, "IEEE Std. 802.15.4, Part. 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks".

- Update G3-PLC usage in section 4.1

In the G3-PLC specification, the 6lo adaption layer utilizes the 6LoWPAN functions (e.g. header compression, fragmentation and reassembly). However, due to the different characteristics of the PLC media, the 6LoWPAN adaptation layer cannot perfectly fulfill the requirements[I-D.ietf-6lo-plc]. The ESC dispatch type is used in the G3-PLC to provide native mesh routing and bootstrapping functionalities[RFC8066].

Update after IETF105 (3/3) (Comments from Pascal)

–Update Guidelines for adopting IPv6 stack in section 5

- o Address Assignment: 6LoWPAN developed a new version of IPv6 Neighbor Discovery[RFC4861][RFC4862] that relies on a proactive registration to avoid the use of multicast. 6LoWPAN Neighbor Discovery[RFC6775][RFC8505] inherits from IPv6 Neighbor Discovery for mechanisms such as Stateless Address Autoconfiguration(SLAAC) and Neighbor Unreachability Detection(NUD), but uses a unicast method for Duplicate Address Detection(DAD), and avoids multicast lookups from all nodes by using non-onlink prefixes. A 6LoWPAN Node is also expected to be an IPv6 host per[RFC8200] which means it should ignore consumed routing headers and Hop-by-Hop options; when operating in a RPL network[RFC6550], it is also beneficial to support IP-in-IP encapsulation [I-D.ietf-roll-useofrplinfo]. The 6LoWPAN Node should also support [RFC8505] and use it as the default Neighbor Discovery method. It is the responsibility of

Next steps

- Ask comments regarding to the scope of this draft
 - 6lo link layer technologies
 - IEEE 802.15.4 and IEEE 802.15.4e are out of scope
 - IEEE 802.11ah is out of scope
 - 6lo deployment scenarios
 - jupitermesh and Wi-SUN based on IEEE 802.15.4 are out of scope
- Update the draft to reflect comments
 - Comments from Liubing (Remy)
 - It is expected to cover other low power technologies as well. Another solution could be, moving the current text to PLC related sections, e.g. the section 3.6 or the section 6.6.
 - In the chapter 5, for the bullet "Mesh or L3 routing", it would be better to have an example for mesh routing at L2, e.g. LOADng in G3 plc.

Thanks!!

Questions & Comments