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

draft-ietf-6lo-use-cases-10

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History and status

– WG document : draft-ietf-6lo-use-cases-00 (Nov.2.2016)

– 1th revision : draft-ietf-6lo-use-cases-01 (Mar.13.2017)

– 2nd revision : draft-ietf-6lo-use-cases-02 (Jul.03.2017)

– 3th revision : draft-ietf-6lo-use-cases-03 (Oct.30.2017)

– 4th revision : draft-ietf-6lo-use-cases-04 (Mar.5.2018)

– 5th revision : draft-ietf-6lo-use-cases-05 (Jun.30.2018)

– 6th revision : draft-ietf-6lo-use-cases-06 (Mar.11.2019)

– 7th revision : draft-ietf-6lo-use-cases-07 (Sep.10.2019)

– 8th revision : draft-ietf-6lo-use-cases-08 (Nov.04.2019)

– 9th revision : draft-ietf-6lo-use-cases-09 (Jul.13.2020)

– **10th revision : draft-ietf-6lo-use-cases-10 (Feb.21.2021)**

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-17

- PLC : draft-ietf-6lo-plc-05

Comparison across 6lo Link layer tech.

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

Comments in 2nd WGLC (1/7)

– Comments from Kerry Lynn

	Comments	Response
1	Page3, As Pascal points out s/6LoPWAN/ 6LoWPAN/ in four places	Change 6LoPWAN into 6LoWPAN
2	Page3, s/make the need/create the need/	Change to 'create the need'
3	Page3, s/are uniquely different from/ expand upon/	Change to "expand upon'
4	Page4, s/wire/wired/	Change to 'wired'
5	Section 3.4 (page 6), Please delete the last sentence as it basically repeats the first sentence.	Delete the last sentence

Comments in 2ⁿᵈ WGLC (2/7)

– Comments from S.V.R. Anand

	Comments	Response
1	Refer to Section 5 "Guidelines for adopting IPv6 stack (6lo/6LoWPAN)". Since the draft is about 6Lo, like other sections, it is better to use only 6Lo in the section title just for consistency.	Delete the express of 6LoWPAN in the title and change into "Guidelines for adopting IPv6 stack (6lo)"
2	Certain parts of the same section requires a bit of rewording so that the reader feels it is a 6Lo document rather than a summary of 6LoWPAN protocols. I know that the intention of the authors is to convey that the existing 6LoWPAN standards can be considered and adopted to 6Lo.	We added the following sentence at the beginning of the section: "6lo aims at reusing and/or adapting existing 6LoWPAN functionality in order to efficiently support IPv6 over a variety of IoT L2 technologies.
3	For 6Lo networks that use wired link layer technologies, a short note on whether and how 6LoWPAN can possibly be adopted helps.	6lo networks that use wired link layer technologies is PLC. There are already relevant text.
4	The emergence of BACnet IP as an alternative for BACnet MS/TP cannot be ignored. Considering the current and future trend, why the latter is still relevant needs to be captured in the document to motivate the reader.	Added a couple of sentences at the end of the first paragraph of 6.4.
5	Refer to 6.2 "Use case of Bluetooth LE: Smartphone-based Interaction". The need for 6Lo for this use-case is not coming out clearly. It would be good to explain.	Added the sentence: "6lo enables this use case by providing efficient end-to-end IPv6 support."

Comments in 2nd WGLC (3/7)

– Comments from Seyed Mahdi Darroudi

	Comments	Response
1	section 3.6 : The text "PLC is a data transmission technique that utilizes power conductors as medium" is duplicated.	Delete the last duplicated sentence
2	table 2 : In BLE column, more than RFC 7668, it also may need to be added "I-D.ietf-6lo-blemesh".	Add draft-6lo-blemesh in table 2

Comments in 2nd WGLC (4/7)

– Comments from Pascal Thubert

	Comments	Response
1	I feel there should be a pass on grammar by a native speaker before the IETF last call. Some things, mostly at the beginning, sound strange to my hear but being non-native I do not feel entitled / capable to comment on that.	We did our best to improve the writing of the document.
2	There are occurrences of mis-typing 6LoWPAN as below	Change 6LoPWAN to 6LoWPAN
3	Update Neighbor Discovery Optimization for 6LoWPAN [RFC6775] to include [RFC8505]	Udpate the reference of RFC 8505
4	Not sure you need section 2 with the BCP 14 language. This is an informational draft	Delete section 2 (Conventions and Terminology)
5	Section 3.2: the Bluetooth SIG is mostly done with the effort named "IP Link" within the Internet Workgroup, to provide an optimized transport over BLE 5 Extended Advertisements for 6LoWPAN HC and above it Thread. I believe that is worth mentioning? Contacts, if you need more, would be Martin Turon mturon@google.com<mailto:mturon@google.com> and Himanshu Bhalla himanshu.bhalla@intel.com<mailto:himanshu.bhalla@intel.com>.	There seems to be no publicly available information regarding the IP Link effort. We would like to add information on that, but only as long as it is publicly available.

Comments in 2nd WGLC (5/7)

– Comments from Pascal Thubert (cont'd)

	Comments	Response
6	Section 3.6 . G3 PLC uses an escaped 6LoWPAN, and you discuss it in 4.1. Why not a word with a forward reference here?	Add a short text of G3 PLC and a reference
7	Section 4 has G9903 and Netricity but IMHO it's missing Wi-SUN (https://wi-sun.org/). This looks like an unfair omission. Wi-SUN combines 6LoWPAN and RPL, and arguably uses a different 802.15.4 since it is SubGig 15.4g, without the frame size constraint and multiple PHY rates. You may use https://tools.ietf.org/html/rfc8376#section-2.4 as a reference.	Restore the section of Wi-SUN
8	The major application is smartgrid AMI, but due to its slow channel hopping method, it is close ot 6TiSCH and provides a similar applicability, e.g., grid and factory automation.	In Wi-SUN section, there are already text of factory automation.
9	Section 4 is also missing Thread https://www.threadgroup.org/. Arguably that is classical 802.15.4 but in fact since Thread is route-over, links of various MAC/PHY technologies could be integrated, think Wi-Fi or BLE. This is a better story for IPv6 than a home IoT networking technology like those listed in 6.1 or 6.3 which stick to a single MAC/PHY. Applicability includes home networks and building, e.g., for lighting.	Add a section of Thread
10	Section 5 is really neat and useful. I'd love to see it earlier, why is it between 4 and 6???	Adjust the location section 5 more earlier

Comments in 2nd WGLC (6/7)

– Comments from Pascal Thubert (cont'd)

	Comments	Response
11	One crucial point is the use of broadcast. Together with L3-routing, 6LoWPAN ND reduces that a lot vs. classical ND. Could you add words or a bullet on this, maybe splitting "o Address Assignment:" into "o Address Assignment :", which is a bit long as is, and something like "o broadcast avoidance:"	We add relevant text of 6LoWPAN ND in the Broadcast Avoidance bullet.
12	Section 5 mentions RPL several times; it also mentions 6LoWPAN ND (all good!). There was indeed a special effort integrating those two, and more. * This effort shows in RFC 8138 (and https://datatracker.ietf.org/doc/draft-ietf-roll-turnon-rfc8138/), which extends 6LoWPAN HC to compress also the RPL artifacts used when forwarding packets in the route-over mesh. This could be mentioned in the " o Header Compression:" bullet. * This effort also shows in https://datatracker.ietf.org/doc/draft-ietf-roll-unaware-leaves/ that allows a 6LoWPAN node, called a RUL, to benefit from routing-over services in a RPL network without speaking RPL per se; instead, RFC 8505 is used as a protocol-independent registration to obtain routing services from RPL. The bottom line is that 6LoWPAN provides a rich host-to-router interface for constrained network, that is now leverage to enable router-to-router protocols (including RPL and RIFT). Maybe you could have a "o Host-to-Router abstract interface:" bullet? * RFC 8505 is also used to request proxy ND services in case of a backbone, see https://datatracker.ietf.org/doc/draft-ietf-6lo-backbone-router/; you mention the backbone but not the backbone router. Maybe that's another bullet?	We add Host-to-Router interface and Proxy Neighbor Discovery bullets.
13	By the time you publish the next version AP-ND will probably be published as RFC 8928 (and 6BBR as RFC 8929)	We update the reference.
14	6lo working group is working on address authentication [I-D.ietf-6lo-ap-nd<https://datatracker.ietf.org/doc/html/draft-ietf-6lo-use-cases-09#ref-I-D.ietf-6lo-ap-nd>] a -> Address Protection for 6LoWPAN ND (AP-ND) [RFC8928] enables Source Address Validation [RFC6620] and protects the Address Ownership against impersonation attacks.	We update the relevant text in the Address Assignment bullet.
15	Section 6.3: the big thing with DECT is that the you get something like 20MHz of spectrum (and 10 channels) around the 1900MHz that is reserved for the usage of "cordless phones". It is much easier to control its usage in a given area such as a factory or a hospital, so it is more suitable for critical applications than, say, Zigbee; I'd have loved a healthcare use case. But OK.	No action

Comments in 2nd WGLC (7/7)

– Comments from Houjiangiang (Derek)

	Comments	Response
1	IEEE 1901.1(PLC-IOT) is missing in the reference, and the recommended reference format can be as below: [IEEE1901.1] "IEEE Standard for Medium Frequency (less than 12 MHz) Power Line Communications for Smart Grid Applications", 2018, https://standards.ieee.org/standard/1901_1-2018.html.	Add a reference of IEEE 1901.1
2	In section 6.6, there is one typo in the paragraph as below. This paragraph is introducing 1901.1, thus the " variant (IEEE1901.2)" should be " variant (IEEE1901.1)" //////Example: Use of PLC (IEEE1901.1) for WASA in Smart Grid ///Many sub-systems of Smart Grid require low data rate and narrowband ///variant (IEEE1901.2) of PLC fulfils such requirements. Recently, ////more complex scenarios are emerging that require higher data rates.	Change into "variant (IEEE1901.1)"
3	There is a small error in the table in section 3.6. The frequency range for IEEE 1901.1 is smaller than 12MHz, not 15MHz	Change into 12MHz in table 1
4	In section 3.6 PLC, there are 2 paragraphs introducing IEEE1901 and IEEE1901.2, but the introduction for IEEE1901.1 is missing. Here I write an example: [IEEE1901.1] defines a medium frequency band (less than 12 MHz) broadband PLC technology for smart grid applications (SGPLC) based on orthogonal frequency division multiplexing (OFDM). By achieving an extended communication range with medium speeds, this standard can be applied both in indoor and outdoor scenarios, such as Advanced Metering Infrastructure (AMI), street lighting, electric vehicle charging, smart city etc.	Update the section 3.6 as proposed text

Update after IETF109 (1/2)

< 09-version draft >

< 10-version draft >

Update after IETF109 (2/2)

– Update the whole paragraph to improve the writing of the document

– Add two 6lo deployment scenarios
  • Wi-SUN usage of 6lo in network layer
  • Thread usage of 6lo in network layer

– Update PLC part to include IEEE 1901.1 and G3-PLC

Thanks!!

Questions & Comments