

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

draft-ietf-6lo-use-cases-02

Y-G. Hong (ETRI), C. Gomez (UPC/i2cat),
Y-H. Choi (ETRI), D-Y. Ko (SKTelecom),
AR. Sangi, T. Aanstoot (Modio AB),
S. Chakrabarti

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History and status

- Discussed from IETF 89 (Mar. 2014)
- Initial Document: draft-hong-6lo-use-cases-00 (Oct.17.2015)
 - Presented at IETF-94 6lo WG meeting
- WG document : draft-ietf-6lo-use-cases-00 (Nov.2.2016)
- 1st revision : draft-ietf-6lo-use-cases-01 (Mar.12.2017)
- 2nd revision : draft-ietf-6lo-use-cases-02 (Jul.3.2017)

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.

Update based on IETF98 comments

Shortened, cleaned up and focused on Applicability

- Specified 6lo link layer technologies in a nutshell
 - Added a comparison table on 6lo technology usage
 - LTE-MTC is used as an example of potential 6lowpan L2-candidate
- Two 6lo deployment scenarios from external SDO
 - Wi-SUN
 - jupiterMesh
- A section of guidelines for 6lo/6lowpan adaptation is added
- Moved 6lo use case examples to Appendix (for now)
- Additional editorial comments
- Author added
 - Samita Chakrabarti helped with document re-organization

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-07
- PLC : IEEE 1901.2, draft-hou-6lo-plc-01
- IEEE 802.15.4e : RFC 7554
- (Potential candidate) LTE MTC : 3GPP TS 36.306 V13.0.0

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	District Heating	Health care Services	Smart Grid	Industrial Automation
Technology & Subnet	L2-mesh or L3-mesh	Star No mesh	Star No mesh	Bus MS/TP	P2P L2-mesh	Tree No 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-hou-6lo-plc	RFC 7554

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

- It targets candidates for new constrained L2 technologies that consider running modified 6LoWPAN stack
- The modification of 6LoWPAN stack should be based on the following:
 - Addressing Model
 - MTU Considerations
 - Mesh or L3-Routing
 - Address Assignment
 - Header Compression
 - Security and Encryption
 - Additional processing

6lo Deployment Scenarios : Wi-SUN

- Wi-SUN technology
 - Based on the IEEE 802.15.4g standard
 - Wi-SUN networks support star and mesh topologies, as well as hybrid star/mesh deployments
 - Wi-SUN networks are deployed on both powered and battery-operated devices
- Wi-SUN Field Area Network (FAN) technology
 - Cover primarily outdoor networks, and its specification is oriented towards meeting the more rigorous challenges of these environments
 - Adaptation layer based on 6lo and IPv6 network layer are described
- Wi-SUN usage of 6lo stacks
 - Advanced Metering Infrastructure (AMI)
 - Distribution Automation (DA)

[*. On behalf of Wi-SUN Alliance, Paul Duffy helped to prepare text]

6lo Deployment Scenarios : jupiterMesh

–jupiterMesh specification is based on

- PHY layer : IEEE 802.15.4 SUN specification [IEEE 802.15.4-2015]
- MAC layer : IEEE 802.15.4 TSCH specification
- Network layer : DHCPv6 [RFC3315], 6lo/6LoPWAN header compression [RFC6282], RPL [RFC6550]

–jupiterMesh in Smart Grid using 6lo in network layer

- Multi-hop wireless mesh network specification designed mainly for deployment in large geographical areas
- Each subnet in jupiterMesh is able to cover an entire neighborhood with thousands of nodes consisting of IPv6-enabled routers and end-points

[*. On behalf of jupiterMesh WG, Michel Veillette and Das Subir provided related text]

Design space dimensions for 6lo use cases

- Deployment/Bootstrapping
- Topology
- L2-Mesh or L3-Mesh
- Multi-link subnet
- Data rate
- Buffering requirements
- Security Requirements
- Mobility across 6lo networks and subnets
- Time synchronization requirements
- Reliability and QoS
- Traffic patterns
- Security Bootstrapping
- Power use strategy
- Update firmware requirements

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 with Constrained Devices
 - 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: Management of District Heating
 - Example: use of MS/TP for management of district heating

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

Thanks!!

Questions & Comments