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AND NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Internet of things and smart cities and communities –
Frameworks, architectures and protocols

Framework of constrained device networking in the IoT environments

Recommendation ITU-T Y.4451



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Recommendation ITU-T Y.4451

Framework of constrained device networking in the IoT environments

Summary

In Internet of things (IoT) environments, constrained devices, equipped with various low-power wireless interfaces, have connection capability to locally available networks for the purpose of interacting with the real world. Constrained devices have many different characteristics. Recommendation ITU-T Y.4451 specifies the framework of constrained device networking in the Internet of things (IoT) environments. This Recommendation therefore describes the concept and features of constrained device networking as well as network architectures of constrained device networking including functional requirements, such as fragmentation, reassembly, header compression, address configuration, network management, multi-hop routing protocol and higher layer considerations.

This Recommendation specifies the framework of constrained device networking in the Internet of things (IoT) environments with respect to IoT device communications. This Recommendation describes the concept of constrained device networking in the IoT environments and the communication of constrained devices. This Recommendation also describes network architecture and mechanisms of constrained device networking.

History

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* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/1830-en>.

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In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Recommendation ITU-T Y.4451

Framework of constrained device networking in the IoT environments

1 Scope

The scope of this Recommendation includes the following:

- An overview of constrained device networking in the IoT environments.
- Communication of constrained devices.
- Architectures of constrained device networking.
- Functionalities of constrained device networking.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T G.9959] Recommendation ITU-T G.9959 (2015), *Short range narrow-band digital radiocommunication transceivers – PHY, MAC, SAR and LLC layer specifications*.
- [ITU-T Y.4000] Recommendation ITU-T Y.4000/Y.2060 (2012), *Overview of the Internet of things*.
- [ITU-T Y.4109] Recommendation ITU-T Y.4109/Y.2061 (2012), *Requirements for the support of machine-oriented communication applications in the next generation network environment*.
- [IETF RFC 4862] IETF RFC 4862 (2007), *IPv6 Stateless Address Autoconfiguration*.
- [IETF RFC 4944] IETF RFC 4944 (2007), *Transmission of IPv6 Packets over IEEE 802.15.4 Networks*.
- [IETF RFC 5225] IETF RFC 5225 (2008), *RObust Header Compression Version 2 (ROHCv2): Profiles for RTP, UDP, IP, ESP and UDP-Lite*.
- [IETF RFC 6282] IETF RFC 6282 (2011), *Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks*.
- [IETF RFC 6550] IETF RFC 6550 (2012), *RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks*.
- [IETF RFC 7400] IETF RFC 7400 (2014), *6LoWPAN-GHC: Generic Header Compression for IPv6 over Low-Power Wireless Personal Area Networks (6LoWPANs)*.
- [IETF RFC 7428] IETF RFC 7428 (2015), *Transmission of IPv6 Packets over ITU-T G.9959 Networks*.
- [IETF RFC 7668] IETF RFC 7668 (2015), *IPv6 over BLUETOOTH(R) Low Energy*.
- [IETF RFC 7721] IETF RFC 7721 (2016), *Security and Privacy Considerations for IPv6 Address Generation Mechanisms*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 device [ITU-T Y.4000]: With regard to the Internet of things, this is a piece of equipment with the mandatory capabilities of communication and the optional capabilities of sensing, actuation, data capture, data storage and data processing.

3.1.2 Internet of things (IoT) [ITU-T Y.4000]: A global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

NOTE 1 – Through the exploitation of identification, data capture, processing and communication capabilities, the IoT makes full use of things to offer services to all kinds of applications, whilst ensuring that security and privacy requirements are fulfilled.

NOTE 2 – From a broader perspective, the IoT can be perceived as a vision with technological and societal implications.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 constrained device: A device that has constraints on characteristics such as limited processing capability, small memory capability, limited battery power, short range and low bit rate.

3.2.2 adaptation layer: A layer that is required for binding the network layer and the datalink layer in low-power network technologies.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

BLE	Bluetooth Low Energy
IoT	Internet of Things
LLCP	Logical Link Control Protocol
LoWPAN	Low-power Wireless Personal Area Network
MP2P	Multipoint-to-Point (MP2P)
MTU	Maximum Transmission Unit
NFC	Near Field Communication
POS	Personal Operating Space
P2MP	Point-to-Multipoint
P2P	Point-to-Point
QoS	Quality of Service
SNMP	Simple Network Management Protocol
SSAP	Source Service Access Point

5 Conventions

None.