

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Y.4113

(09/2016)

SERIES Y: GLOBAL INFORMATION
INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS, INTERNET OF
THINGS AND SMART CITIES

Internet of things and smart cities and communities –
Requirements and use cases

Requirements of the network for the Internet of things

Recommendation ITU-T Y.4113

ITU-T

ITU-T Y-SERIES RECOMMENDATIONS

GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS, INTERNET OF THINGS AND SMART CITIES

GLOBAL INFORMATION INFRASTRUCTURE

General	Y.100–Y.199
Services, applications and middleware	Y.200–Y.299
Network aspects	Y.300–Y.399
Interfaces and protocols	Y.400–Y.499
Numbering, addressing and naming	Y.500–Y.599
Operation, administration and maintenance	Y.600–Y.699
Security	Y.700–Y.799
Performances	Y.800–Y.899

INTERNET PROTOCOL ASPECTS

General	Y.1000–Y.1099
Services and applications	Y.1100–Y.1199
Architecture, access, network capabilities and resource management	Y.1200–Y.1299
Transport	Y.1300–Y.1399
Interworking	Y.1400–Y.1499
Quality of service and network performance	Y.1500–Y.1599
Signalling	Y.1600–Y.1699
Operation, administration and maintenance	Y.1700–Y.1799
Charging	Y.1800–Y.1899
IPTV over NGN	Y.1900–Y.1999

NEXT GENERATION NETWORKS

Frameworks and functional architecture models	Y.2000–Y.2099
Quality of Service and performance	Y.2100–Y.2199
Service aspects: Service capabilities and service architecture	Y.2200–Y.2249
Service aspects: Interoperability of services and networks in NGN	Y.2250–Y.2299
Enhancements to NGN	Y.2300–Y.2399
Network management	Y.2400–Y.2499
Network control architectures and protocols	Y.2500–Y.2599
Packet-based Networks	Y.2600–Y.2699
Security	Y.2700–Y.2799
Generalized mobility	Y.2800–Y.2899
Carrier grade open environment	Y.2900–Y.2999

FUTURE NETWORKS

CLOUD COMPUTING	Y.3000–Y.3499
	Y.3500–Y.3999

INTERNET OF THINGS AND SMART CITIES AND COMMUNITIES

General	Y.4000–Y.4049
Definitions and terminologies	Y.4050–Y.4099
Requirements and use cases	Y.4100–Y.4249
Infrastructure, connectivity and networks	Y.4250–Y.4399
Frameworks, architectures and protocols	Y.4400–Y.4549
Services, applications, computation and data processing	Y.4550–Y.4699
Management, control and performance	Y.4700–Y.4799
Identification and security	Y.4800–Y.4899
Evaluation and assessment	Y.4900–Y.4999

For further details, please refer to the list of ITU-T Recommendations.

Recommendation ITU-T Y.4113

Requirements of the network for the Internet of things

Summary

Recommendation ITU-T Y.4113 describes the requirements of the network for the Internet of things (IoT) that enhance the common requirements of the IoT identified in Recommendation ITU-T Y.4100/Y.2066. The requirements focus on the transport functions of the network, but also cover service support functions.

The requirements described in this Recommendation are common requirements for core network, access network and IoT area network.

There are a lot of use cases of the IoT with heterogeneous characteristics. Considering the current status of deployments in the IoT market, this Recommendation focuses on the requirements of the network for the IoT with smart meters and sensors as devices. Other use cases will be covered in the future revisions of this Recommendation.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T Y.4113	2016-09-13	20	11.1002/1000/13025

Keywords

Internet of Things, requirements of the network, sensor, smart meter.

* 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/11.1002/1000/11830-en>.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2016

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

		Page
1	Scope.....	1
2	References.....	1
3	Definitions	2
	3.1 Terms defined elsewhere	2
	3.2 Terms defined in this Recommendation.....	2
4	Abbreviations and acronyms	2
5	Conventions	3
6	General description of the network for the IoT	3
	6.1 Basic model of the network for the IoT.....	3
	6.2 General characteristics of smart meters and sensors as devices for the IoT ..	4
	6.3 General issues of the network for the IoT	5
7	Requirements of the network for the IoT	6
	7.1 General requirements.....	6
	7.2 Core network requirements	6
	7.3 IoT area network requirements.....	10
	Appendix I – Examples of use cases of smart meters and sensors	12
	I.1 Smart meters and sensors	12
	I.2 IoT area network.....	15
	Appendix II – Access network and IoT area network technologies	18
	II.1 Access-specific aspects relating to core network requirements	18
	Bibliography.....	20

Copyright International Telecommunication Union/ITU Telecommunication Sector
Provided by IHS Markit under license with ITU-T
No reproduction or networking permitted without license from IHS

Recommendation ITU-T Y.4113

Requirements of the network for the Internet of things

1 Scope

This Recommendation describes the requirements of the network for the Internet of things (IoT). The common requirements of the IoT described in [ITU-T Y.4100] are high-level; thus this Recommendation is complementary to [ITU-T Y.4100] in term of specific requirements of the network for the IoT.

Because an increasing number of devices with heterogeneous characteristics will be connected to the network via varying access technologies depending on the specific deployment environment, it is important to consider the requirements of the network that are applicable to those various use cases of the IoT, and avoid case-by-case studies for each specific use case. This approach is expected to encourage IoT development.

There are many use cases of the IoT with heterogeneous characteristics. Considering the current status of the deployments in the IoT market, this Recommendation focuses on the network for the IoT with smart meters and sensors as device for the IoT. Other use cases will be covered in future revisions of this Recommendation.

The scope of this Recommendation includes:

- general description of the network for the IoT, addressing respectively:
 - basic model of the network for the IoT;
 - general characteristics of smart meters and sensors;
 - general issues of the network for the IoT.
- requirements of the network for the IoT, addressing respectively:
 - general requirements;
 - core network requirements;
 - IoT area network requirements.

Examples of use cases with smart meters and sensors are described in Appendix I.

Several access network and IoT area network technologies for the network supporting the IoT are identified in Appendix II.

NOTE – The technologies listed in Appendix II are not meant to be exhaustive.

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 Y.4000] Recommendation ITU-T Y.4000/Y.2060 (2012), *Overview of the Internet of things*.

[ITU-T Y.4100] Recommendation ITU-T Y.4100/Y.2066 (2014), *Common requirements of the Internet of things*.

[ITU-T Y.4101] Recommendation ITU-T Y.4101/Y.2067 (2014), *Common requirements and capabilities of a gateway for Internet of things applications*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 access network [b-ITU-T Q.1742.11]: A network that connects access technologies (such as a radio access network) to the core network.

3.1.2 core network [b-ITU-T Y.101]: A portion of the delivery system composed of networks, systems equipment and infrastructures, connecting the service providers to the access network.

3.1.3 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.

3.1.4 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.

3.1.5 thing [ITU-T Y.4000]: With regard to the Internet of things, this is an object of the physical world (physical things) or the information world (virtual things), which is capable of being identified and integrated into communication networks.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 IoT area network: A network of devices for the IoT and gateways interconnected through local connections.

NOTE – This definition is based on "Overview of the Internet of things" [ITU-T Y.4000], where clause 6.2 states "devices can communicate with other devices using direct communication through a local network (i.e., a network providing local connectivity between devices and between devices and a gateway, such as an ad-hoc network)".

3.2.2 sensor: (Based on the definition given in [b-ITU-T Y.2221]) An electronic device that senses a physical condition or chemical compound and delivers an electronic signal proportional to the observed characteristic.

NOTE – Examples of usage of sensors include temperature monitoring, gas-leak alert, traffic congestion prediction, earthquake early warning, etc.

3.2.3 smart meter: With regard to the Internet of things, a device for monitoring, measurement recording and control of utility usage.

NOTE – Examples of utilities include electricity, gas and water.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

2G Second Generation wireless telephony technology

3G	Third Generation wireless telephony technology
ADSL	Asymmetric Digital Subscriber Line
API	Application Programming Interface
DSL	Digital Subscriber Line
FTTx	Fiber To The x
IEEE	Institute of Electrical and Electronics Engineers
IoT	Internet of Things
LAN	Local Area Network
LPWA	Low Power Wide Area
LTE	Long Term Evolution
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PSTN	Public Switched Telephone Network
SDSL	Symmetric Digital Subscriber Line
ULE	Ultra Low Energy
xDSL	x Digital Subscriber Line

5 Conventions

In this Recommendation:

The keywords "**is required to**" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "**is recommended**" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement need not be present to claim conformance.

The keywords "**can optionally**" and "**may**" indicate an optional requirement which is permissible, without implying any sense of being recommended. These terms are not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

6 General description of the network for the IoT

This clause introduces a basic model of the network for the IoT, general characteristics of smart meters and sensors, and general issues of the network for the IoT.

6.1 Basic model of the network for the IoT

The basic model of the network for the IoT consists of three parts as shown in Figure.1: core network, access network and IoT area network.