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INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Next Generation Networks – Frameworks and functional
architecture models

Common requirements of the Internet of things

Recommendation ITU-T Y.2066

ITU-T

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Recommendation ITU-T Y.2066

Common requirements of the Internet of things

Summary

Recommendation ITU-T Y.2066 provides the common requirements of the Internet of things (IoT). These requirements are based on general use cases of the IoT and IoT actors, which are built from the definition of IoT contained in Recommendation ITU-T Y.2060. The common requirements of the IoT are independent of any specific application domain, which refer to the areas of knowledge or activity applied for one specific economic, commercial, social or administrative scope, such as transport application domain and health application domain.

This Recommendation builds on the overview of IoT (Recommendation ITU-T Y.2060), developing the common requirements based on general use cases of the IoT and the IoT actors and taking into account important areas of consideration from a requirement perspective. Some representative use cases of the IoT, which are abstracted from application domains, are also provided. The common requirements of the IoT specified in this Recommendation are classified into the categories of non-functional requirements, application support requirements, service requirements, communication requirements, device requirements, data management requirements and security and privacy protection requirements.

History

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Common requirements, functional requirements, Internet of things (IoT), non-functional requirements, use cases.

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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.

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Recommendation ITU-T Y.2066

Common requirements of the Internet of things

1 Scope

This Recommendation provides the common requirements of the Internet of things (IoT). These requirements are based on general use cases of the IoT and IoT actors, which are built from the definition of IoT contained in [ITU-T Y.2060]. The common requirements of the IoT are independent of any specific application domain, which refer to the areas of knowledge or activity applied for one specific economic, commercial, social or administrative scope, such as transport application domain and health application domain.

This Recommendation builds on the overview of IoT [ITU-T Y.2060], developing the common requirements based on general use cases of the IoT and IoT actors and taking into account important areas of consideration from a requirement perspective. The common requirements of the IoT specified in this Recommendation are classified into the categories of non-functional requirements, application support requirements, service requirements, communication requirements, device requirements, data management requirements and security and privacy protection requirements.

The scope of this Recommendation includes:

- general use cases of the IoT
- IoT actors
- important areas of consideration from a requirement perspective
- common requirements of the IoT.

The common requirements of the IoT are summarized and numbered in Annex A.

Some representative use cases of the IoT, which are abstracted from application domains, are provided in Appendix I.

NOTE – Regulatory, legal and business aspects are outside the scope of this Recommendation. Protocol and interface related requirements (e.g., for the control and management aspects of IoT) are also outside the scope of this Recommendation.

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

[ITU-T Y.2091] Recommendation ITU-T Y.2091 (2011), *Terms and definitions for next generation networks*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 application [ITU-T Y.2091]: A structured set of capabilities, which provide value-added functionality supported by one or more services, which may be supported by an API interface.

3.1.2 customer [ITU-T Y.2091]: The customer buys products and services from the enterprise or receives free offers or services. A customer may be a person or a business.

NOTE – There can be many users per customer.

3.1.3 device [ITU-T Y.2060]: With regard to the Internet of things, this is a piece of equipment with the mandatory capabilities of communication and optional capabilities of sensing, actuation, data capture, data storage and data processing.

3.1.4 Internet of things (IoT) [ITU-T Y.2060]: 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 – In a broad perspective, the IoT can be perceived as a vision with technological and societal implications.

3.1.5 service [ITU-T Y.2091]: A set of functions and facilities offered to a user by a provider.

3.1.6 thing [ITU-T Y.2060]: 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 term:

3.2.1 application domain: An area of knowledge or activity applied for one specific economic, commercial, social or administrative scope.

NOTE – Transport application domain, health application domain and government application domain are examples of application domains.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

2G	Second Generation
3G	Third Generation
API	Application Programming Interface
CAN	Controller Area Network
DSL	Digital Subscriber Line
IoT	Internet of Things
ITS	Intelligent Transport Systems
LTE	Long Term Evolution
M2M	Machine-to-Machine

MOC	Machine Oriented Communication
SDP	Service Delivery Platform
SLA	Service Level Agreement
UML	Unified Modelling Language
WiFi	Wireless Fidelity

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/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

6 General use cases of the IoT and IoT actors

This clause describes general use cases of the IoT and IoT actors and the relations among general use cases and IoT actors. An IoT actor specified in this Recommendation refers to an entity that is external to the IoT and that interacts with the IoT.

6.1 General use cases

The general use cases are built from the definition of IoT contained in [ITU-T Y.2060].

According to the definition of IoT, given in [ITU-T Y.2060], IoT enables "advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies". This implies that the IoT interconnects things to sense or actuate things and to provide advanced services, so the general use cases of "IoT sensing or actuating" and "IoT service provision" can be derived.

According to the definition of IoT, as given in [ITU-T Y.2060], "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". This implies that data capture and processing capabilities can be grouped as data management capabilities and privacy protection should be guaranteed. So the general use cases of "IoT data management" and "IoT privacy protection" can be derived.

Figure 6-1 shows the general use case model of the IoT, which is described via unified modelling language (UML), for more information see [b-UML]. This model consists of four general use cases: IoT sensing or actuating, IoT data management, IoT service provision and IoT privacy protection.

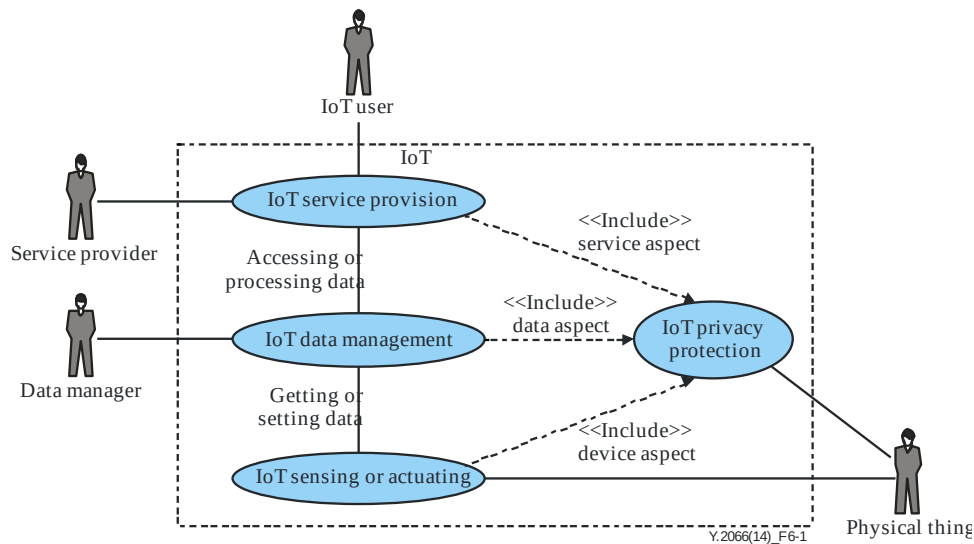


Figure 6-1 – The general use case model of the IoT

NOTE 1 – In [b-UML], a use case is defined as a single unit of meaningful work in a system. It may provide a view of behaviour observable by entities outside the system. The use cases can be used to capture the requirements of a system. A use case model (combination of single units of work) can show the interaction between the system and entities external to the system. These external entities are referred to as "actors" in UML. In this perspective, the IoT becomes the system being modelled with UML while an "IoT actor" is an entity that is outside the IoT, and interacts with the IoT.

NOTE 2 – Some use cases abstracted from IoT applications (the representative use cases described in Appendix I) can be decomposed into the general use cases described in clauses 6.1.1 to 6.1.4, to facilitate the generation of the functional requirements corresponding to the IoT actors. For example, the "video surveillance" use case described in Appendix I.1 can be decomposed into video capturing (IoT sensing or actuating), video transmission and storage (IoT data management) and video replay and analysis (IoT service provision) use cases. These use cases can be used to generate the functional requirements from different actors of video surveillance, such as time synchronization to support real-time video transmission and virtual storage to support storage of a large amount of video continuously generated by video cameras.

6.1.1 "IoT sensing or actuating" use case

"IoT sensing or actuating" use case is a general use case that can be applicable to multiple application domains. This use case involves the activities of connecting with physical things, sensing the states of physical things or actuating the physical things.

6.1.2 "IoT data management" use case

"IoT data management" use case is a general use case that can be applicable to multiple application domains. This use case involves the activities of capturing, transferring, storing and processing the data of physical things.

6.1.3 "IoT service provision" use case

"IoT service provision" use case is a general use case that can be applicable to multiple application domains. This use case involves the activities of providing services by the service provider and using services by the IoT user.

6.1.4 "IoT privacy protection" use case

"IoT privacy protection" use case is a general use case that can be applicable to multiple application domains. This use case involves the activities of securing and hiding the private information of the physical things.