

Recommendation

ITU-T Y.3540 (10/2023)

SERIES Y: Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities

Cloud Computing

Edge computing – Overview and high-level requirements

Global information infrastructure, Internet protocol aspects, next-generation networks, Internet of Things and smart cities

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Recommendation ITU-T Y.3540

Edge computing – Overview and high-level requirements

Summary

Recommendation ITU-T Y.3540 gives an overview and high-level requirements for edge computing. For edge computing, Recommendation ITU-T Y.3540 defines related terms, and gives an overview of its concept, common characteristics and operational ecosystem with main roles. Recommendation ITU-T Y.3540 also describes orchestration aspects for edge computing and its relationship with other technologies. Recommendation ITU-T Y.3540 provides high-level requirements through various use cases.

History*

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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.3540

Edge computing – Overview and high-level requirements

1 Scope

This Recommendation gives an overview and high-level requirements for edge computing. It addresses the following:

- an overview of edge computing;
- an overview of the roles of individual actors in edge-computing operation;
- a technical view of edge computing;
- high-level requirements for edge computing.

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.3073] Recommendation ITU-T Y.3073 (2019), *Framework for service function chaining in information-centric networking*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 cloud computing [b-ITU-T Y.3500]: Paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand.

NOTE – Examples of resources include servers, operating systems, networks, software, applications and storage equipment.

3.1.2 cloud service [b-ITU-T Y.3500]: One or more capabilities offered via cloud computing invoked using a defined interface.

3.1.3 cloud service provider [b-ITU-T Y.3500]: Party which makes cloud services available.

3.1.4 edge computing [ITU-T Y.3073]: This refers to a strategy to deploy processing capability at network edge where end terminals are connected, and to perform the processing of data which is derived from and fed to the end terminals.

3.1.5 Internet of things (IoT) [b-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 – From a broader perspective, the IoT can be perceived as a vision with technological and societal implications.

3.1.6 party [b-ISO 27729]: Natural person or legal person, whether or not incorporated, or a group of either.

3.1.7 role [b-ITU-T Y.3502]: A set of activities that serves a common purpose.

3.1.8 quality of service [b-ITU-T Q.1743]: The collective effect of service performances, which determine the degree of satisfaction of a user of a service. It is characterized by the combined aspects of performance factors applicable to all services, such as:

- service operability performance;
- service accessibility performance;
- service retainability performance;
- service integrity performance; and
- other factors specific to each service.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 edge computing application: Business logic deployed and delivered to users using edge computing service.

3.2.2 edge computing customer: A party corresponding to a natural person or an entity in a business relationship to use an edge computing application or edge computing service.

3.2.3 edge computing infrastructure: Resources that provide processing, network and storage at or near a physical location close to user in edge computing.

3.2.4 edge computing partner: A party that supports or assists an edge computing provider or an edge computing customer, or both.

3.2.5 edge computing provider: A party providing edge computing application available to edge computing customer, and edge computing services available to edge computing customer and edge computing partner.

3.2.6 edge computing service: One or more capabilities provided on edge computing infrastructure.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AI	Artificial Intelligence
AR	Augmented Reality
CCTV	Closed Circuit Television
CPN	Computing Power Network
ECC	Edge-Computing Customer
ECN	Edge-Computing Partner
ECP	Edge-Computing Provider
HD	High Definition
IMT-2020	International Mobile Telecommunication 2020
IoT	Internet of Things
IP	Internet Protocol

MEC	Multi-access Edge Computing
NVMe	Non-Volatile Memory express
PaaS	Platform as a Service
QoS	Quality of Service
RAM	Random Access Memory
URL	Uniform Resource Locator
V2X	Vehicle to everything
VM	Virtual Machine
VR	Virtual Reality
WiFi	Wireless Fidelity

5 Convention

The phrase "is required" indicates a requirement that must be strictly followed and from which no deviation is permitted if conformance to this Recommendation is to be claimed.

The phrase "is recommended" indicates a requirement that is recommended but which is not absolutely required. Thus, this requirement need not be present to claim conformance.

In the body of this Recommendation and its annexes, the words "shall", "shall not", "should" and "may" sometimes appear, in which case they are to be interpreted, respectively, as "is required", "is prohibited from", "is recommended", and "can optionally". The appearance of such phrases or keywords in an appendix or in material explicitly marked as informative are to be interpreted as having no normative intent.

6 Overview of edge computing

6.1 Concept of edge computing

Edge computing is a computing technology to deploy processing capability at a network edge to which end terminals are connected, and to process data that is derived from and fed to the end terminals [ITU-T Y.3073]. A network edge corresponds to a physical location where data are generated or consumed.

Figure 6-1 shows edge computing in terms of the physical location of the computing process. Edge computing users include individuals, applications or systems that generate data (e.g., sensors at the edge of networks). Edge computing users differ from the traditional user of a network because they use applications and services that are deployed as close to them as possible.

Edge computing comprises an application, service and infrastructure, which are described in clauses 6.1.1 to 6.1.3.

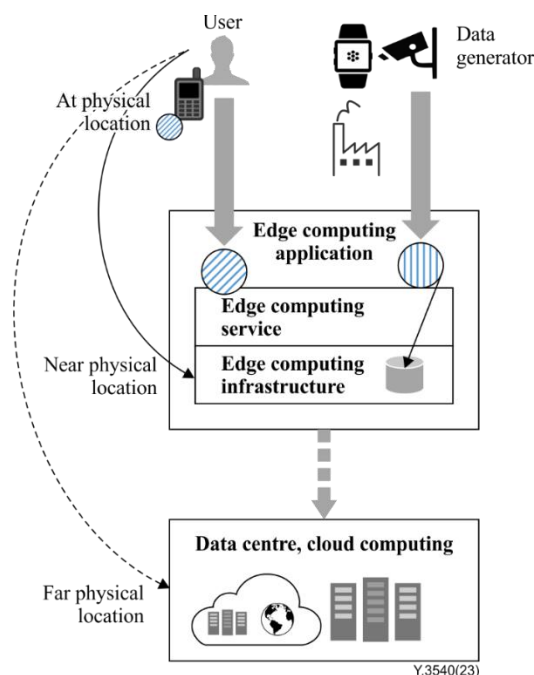


Figure 6-1 – A conceptual diagram of edge computing

6.1.1 Edge-computing application

In edge computing, an application is business logic delivered to users using a service at or near a physical location. Furthermore, the application is then deployed on infrastructure using services in edge computing.

An edge-computing application is used in various application domains such as smart factory, gaming, autonomous vehicle, transportation, smart city, smart retail, smart robot, smart home, healthcare, smart agriculture, smart grid and smart building (see Appendix I).

Examples of edge-computing applications are described as follows.

- Autonomous vehicle: edge computing enables autonomous vehicles: to make real-time decision without the help of a data centre; improves safety; and reduces latency.
- Smart city: edge computing is used to monitor and manage smart city infrastructure such as traffic signal control, smart parking and energy consumption.
- Retail: edge computing enables retail to analyse customer data in real time, allowing target marketing and improvement in the customer shopping experience.
- Healthcare: edge computing processes patient data for personal care, improving the speed and accuracy of diagnosis, treatment and patient monitoring.
- Manufacturing: edge computing improves manufacturing processes by enabling real-time monitoring and optimization of production line.

An edge-computing application processes user proximity data in real time and low latency over the network. For low latency, an edge-computing application uses a high-speed network to connect to the user and maintain seamless connection between that application and the user end terminal.

6.1.2 Edge-computing service

In edge computing, a service is one or more capabilities to provide an application on infrastructure, as shown in Figure 6-2.