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Purpose:	Information

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Abstract:	This document contains initial text for draft new Recommendation ITU-T Y.IoT-DES-fr "Framework of decentralized service by using DLT and edge computing technologies for IoT devices" from Q3/20 Rapporteur Group Meeting (Virtual, 2-5 November 2020).

This document contains initial text for draft new Recommendation ITU-T Y.IoT-DES-fr "Framework of decentralized service by using DLT and edge computing technologies for IoT devices", based on the contribution DOC009-R2 and the discussion on the Q3/20 Rapporteur Group Meeting (02-05 November 2020).

Draft new Recommendation ITU-T Y.IoT-DES-fr

Framework of decentralized service by using DLT and edge computing technologies for IoT devices

AAP Summary

[To be provided before Consent]

Summary

Decentralized services (e.g., enabled by distributed ledger technologies, DLT) for IoT devices can be deployed in local area networks (e.g., in IoT devices or in local IoT gateways for constrained IoT devices) or in clouds (e.g., in remote IoT gateways or in cloud systems). When deployed in local area networks, the decentralized services will be affected by the local storage capability of peers and their computation capability and communication latency among peers. When deployed in clouds, the decentralized services will be affected by speed and efficiency of data access. With the popularization of the use of edge computing, part or whole of functionalities of DLT-based decentralized services can be deployed in edge nodes.

This draft Recommendation introduces decentralized service by using DLT and edge computing technologies, which is an intermediate supporting service between decentralized services in local area networks and that in clouds. Decentralized service by using DLT and edge computing technologies is deployed in edge nodes and can facilitate interaction among peers of decentralized services, no matter where the peers are deployed (e.g., in local areas or in clouds). This draft Recommendation analyses characteristics and high-level requirements of decentralized service by using DLT and edge computing technologies, and provides its functional framework and relevant common capabilities, functionalities and general procedures.

[TBD]

Keyword

blockchain; capability; decentralized service; framework; peer

1   Scope

This draft Recommendation introduces decentralized service by using DLT and edge computing technologies for IoT devices, and analyses its characteristics and high-level requirements, and provides its functional framework and relevant common capabilities, functionalities and general procedures.

The scope of this draft Recommendation includes:

–   introduction of decentralized service by using DLT and edge computing technologies;

–   common characteristics and high-level requirements of decentralized service by using DLT and edge computing technologies;

–   functional framework of decentralized service by using DLT and edge computing technologies and its common capabilities and functionalities, and general procedures.

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; all 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.

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

[TBD]

3   Definitions

3.1   Terms defined elsewhere

This document 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, date capture, data storage and data processing.

3.1.2   Internet of things [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 – In a broad perspective, the IoT can be perceived as a vision with technological and societal implications.

3.1.3   thing [ITU-T Y.4000]: In the Internet of Things, object of the physical world (physical things) or of the information world (virtual things), which is capable of being identified and integrated into the communication networks.

[TBD]

3.2   Terms defined in this Recommendation

This document defines the following terms:

[TBD]

4   Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

  IoT   Internet of Things

  DES   decentralized service by using DLT and edge computing technologies

[TBD]

5   Conventions

The following conventions are used 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 Recommendation 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.

6   Introduction of decentralized edge service

Editor's Note: This clause introduces the concept of decentralized edge service.

Decentralized services (e.g., enabled distributed ledger technologies, DLT) for IoT devices usually are deployed in local area networks (e.g., in IoT devices or in local IoT gateways for constrained IoT devices) or in clouds (e.g., in remote IoT gateways or in cloud systems). When deployed in local area networks, the decentralized services will be affected by the local storage capability of peers and their computation capability and communication latency among peers. When deployed in clouds, the decentralized services will be affected by speed and efficiency of data access. With the popularization of the use of edge computing, part or whole of peers of functionalities of decentralized services can be deployed in edge nodes.

Typically, edge nodes are deployed in edge level, in (or near) base stations of communication networks, or in local information data centres (IDC), which provides services for IoT devices in specific local area networks. Decentralized services can be deployed in edge level (see figure 6-1) to provide decentralized service by using DLT and edge computing technologies (DES). DES is an intermediate supporting service between decentralized services in local area networks and that in clouds. It takes the advantages of edge computing to speed up service efficiency of decentralized services for IoT devices. In general, an edge node usually serves one or multiple specific local area network(s), its storage volume and computing capabilities usually are limited. If those limitations cannot be broke through, DES only may provide part of functionalities of decentralized services, and only may serve part of IoT devices in specific local area networks. Therefore, in this case, DES can provide capabilities, via collaborating with decentralized services in both clouds and local area networks, to perform all the functionalities and to serve all of the IoT devices in the specific local area networks.
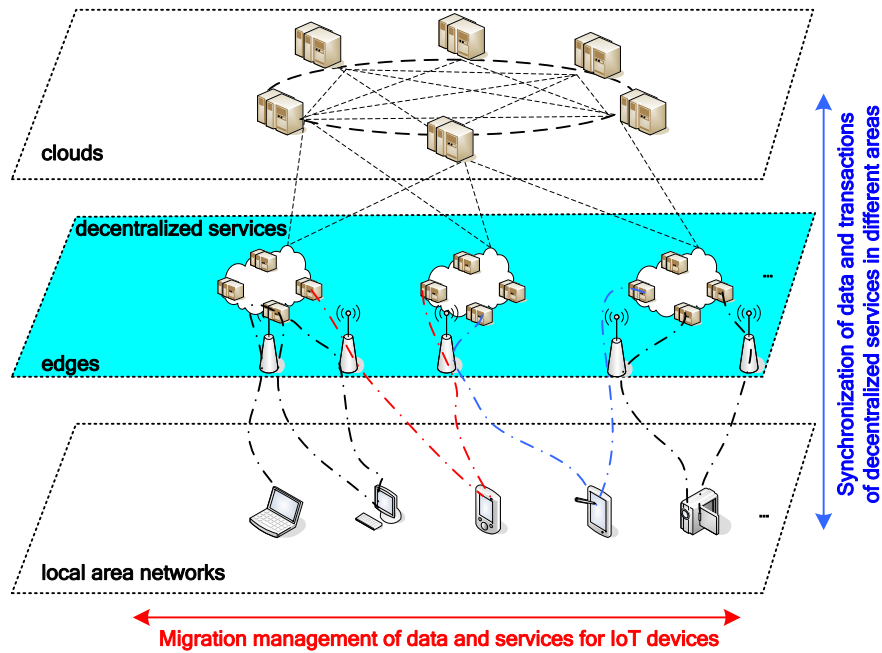
Figure 6-1 - Overview of the decentralized edge services

Typically, when an IoT device accesses to a decentralized service in clouds, DES offers synchronization of data and transactions of the decentralized service between clouds and local area networks. And when an IoT device moves from a local area network to another one which served by different edge nodes, DES can retrieve necessary information (such as mobility information) from the edge nodes and offers migration management of data and services in order to promote the decentralized services for the IoT device.

NOTE – DES can be deployed in multi-access edge computing (MEC) nodes, enabled by functionalities of MEC and MEC nodes (such as mobility notification of IoT devices), but MEC and MEC nodes are out of scope of this draft Recommendation.

[TBD]

7   Common characteristics and high-level requirements of decentralized service by using DLT and edge computing technologies

Editor's Note: This clause brings the common characteristics and high-level requirements of decentralized service by using DLT and edge computing technologies. The potential common characteristics may include intermediate functions, synchronization of data and transactions between edge nodes and cloud nodes, migration management of data and services from one edge node to another node, etc. And then corresponding high-level requirements will be provided.

[TBD]

8   Functional framework of decentralized service by using DLT and edge computing technologies

Editor's Note: This clause provides functional framework of decentralized service by using DLT and edge computing technologies.

[TBD]

9   Capabilities and general procedures of decentralized service by using DLT and edge computing technologies

This clause provides general procedures of decentralized service by using DLT and edge computing technologies, based on the capabilities and functional architecture of decentralized service by using DLT and edge computing technologies.

10   Security consideration

Editor's Note: This clause analyses the security issues of decentralized service by using DLT and edge computing technologies.

[TBD]

Appendix I

Use cases of decentralized edge service for Internet of things

(Note: This appendix does not form an integral part of this draft Recommendation.)

This appendix provides some use cases to illustrate the concept of decentralized edge service.

I.1 Information sharing in Internet of vehicles (IoV)

Decentralized IoV service can be deployed in edge clouds to speed up traffic information sharing among the vehicles (see figure I-1).

When a vehicle moves from one local area networks to others, the decentralized IoV service can get the mobility information of the vehicle from the edge nodes of communication networks, and then prepare service environment for the vehicle, including migration of data and service for the decentralized IoV service.

When the vehicles share traffic information, the entities of decentralized IoV services in core clouds and in edge clouds can synchronize data and transactions for them in order to speed up the sharing operations.
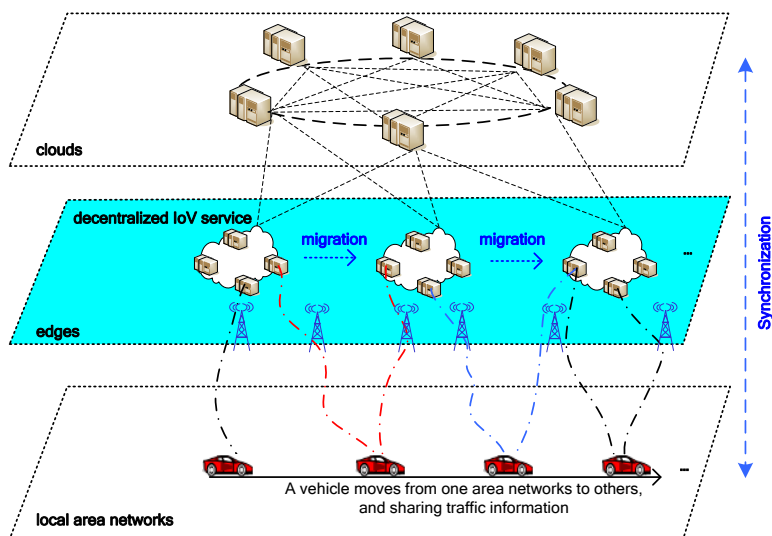
Figure I-1 – Use case of information sharing in Internet of vehicles

Bibliography

[TBD]

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