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Abstract: This is the initial baseline text of new draft Recommendation ITU-T Q.MFDC "Requirements and reference model for monitoring of federated data cooperation service in multi-access edge computing in Future Network", based on the Q13/11 meeting, 10-20 October 2023

This draft Recommendation is based on C304 reviewed at Q13/11 meeting (10-20 October 2023).

Input	Source	Title	Result and action
C304	China Telecommunications Corporation , China Unicom , Ministry of Industry and Information Technology (MIIT) (China)	Proposal to start a new work item - Q. MFDC "Requirements and reference model for monitoring of federated data cooperation service in MEC in Future Network"	Accepted with Modifications. The experts has the following suggestions: 1. Change the abbreviation "MEC" in the title to "multi-access edge computing". 2. Change the sentence "Method of federated data cooperation service monitoring in MEC in Future Network" in the scope to "Method of monitoring of federated data

			cooperation service in MEC in Future Network". 3. Change the "Requirement" word to "Method" in the title of section 8.3.

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Draft New Recommendation ITU-T Q.MFDC

Requirements and reference model for monitoring of federated data cooperation service in multi-access edge computing in Future Network

Summary

This document aims to study the requirements and reference model for monitoring of federated data cooperation service in MEC in Future Network.

Keywords

federated data cooperation service; performance

Table of Content

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Draft New Recommendation ITU-T Q.MFDC

Requirements and reference model for monitoring of federated data cooperation service in multi-access edge computing in Future Network

1 Scope

The scope of this Recommendation consists of:

- General requirement for monitoring of federated data cooperation service in MEC in Future Network
- Method of monitoring of federated data cooperation servicein MEC in Future Network
- Reference model for monitoring of federated data cooperation service in MEC in Future Network.

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.fdcs] Draft Recommendation Y.fdcs (under study) , *Service model of federated data cooperation in multi-access edge computing of future networks.*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 Multi-access edge computing [b-ETSI GS MEC 001]: System which provides an IT service environment and cloud-computing capabilities at the edge of an access network which contains one or more type of access technology, and in close proximity to its users.

3.1.2 remote attestation [b-ITU-T F.748.13]: A method by which a host (client) authenticates its hardware and software configuration to a remote host (server). The goal of remote attestation is to enable a remote system (challenger) to determine the level of trust in the integrity of the platform of another system (attestator).

3.1.3 Federated data cooperation service [ITU-T Y.fdcs**]:** A service which provides federated data cooperation among multiple participants in a decentralized manner either physically or logically on a neutral position. It offers the data and algorithm code discovery, ownership confirmation, needs matching and computing resource schedule.

TBD…

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 *TBD…*

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

FDCS Federated Data Cooperation Service

MEC Multi-access Edge Computing

RA Remote Attestation

TEE Trusted Execution Environment

TBD…

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**" indicate an optional requirement which is permissible, without implying any sense of being recommended. This term is 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 Overview and Introductions

6.1 Background

The development of 5G has greatly changed the way that data are collected and processed in the vertical industry. On one hand, infusing 5G with massive Machine Type of Communication (mMTC) allows massive connections from UE and terminals to the network, profuse operation data thereby are generated whereby evolve enterprises' digital capabilities. On the other hand, applications of 5G such as multi-access edge computing provide the infrastructure for data processing near where the data are generated while obtaining low latencies for time-sensitive data cooperation tasks. Taking advantages of Multi-access Edge Computing, data aggregation, data storage and data processing of vertical industries are burgeoning at the edge, e.g., distributed AI, joint modelling, multi-party computation and computation offloading tasks from the terminals.

Enterprises are committed to achieve data transformation by large-scale data utilization through federated data cooperation service in MEC in Future Network. The federate data cooperation service provides not only the data sharing and collaboration capabilities but also disinterested data and algorithm matching strategies, introducing the capability of which data are utilizable but intangible into Future Network. The implementation of federate data cooperation service depends both on software and hardware regarding to different capabilities obtained. More precisely, while software-based and network-based services provide sufficient abilities to collaboratively work with MEC and internal/external computational and storage infrastructures whilst interacting with users, hardware-based TEE is tenable for rendering federate data cooperation service with confidential computing capabilities.

For federated data cooperation service in MEC, copious factors, such as network availabilities, hardware capabilities etc., can impact the overall performance of data utilization during practical

data cooperation tasks. Realistically, a federate data cooperation task may require synergy of multiple computing infrastructures. Regarding to the distributed computational architecture and potential issues such as variance in network condition, divergence of infrastructure computation and storage capacities, potential risk of device downtime or malfunction of the federated data cooperation service, the accomplishment of the federated data cooperation task depends largely on the delayed completion of the slowest computation nodes, and this delay can radically affect the performance of the service. Moreover, simple breakdowns of external factors such as TEE infrastructures engender the aggravation of performance and instability of the federated data cooperation service, or even lead to doldrums of the tasks. To enhance the liability of federated data cooperation service in MEC, provide proactive and responsive problem-solving finesses and enable timely adjustments or interventions of the service, it is necessary to continuously monitor the statues and performances of key factors involved in real-time. The monitoring parameters the federated data cooperation service in MEC in Future Network should take into consideration shall include but not limited to:

a) Monitor the network performance of federated data cooperation service, i.e. network delay, package loss, throughput, etc.;
b) Monitor the utilization, availability, and stability of computing resources;
c) Monitor the remote verification or third-party verification statues of TEEs;
d) Monitor the degree of participation of computing resources during a federated data cooperation task;
e) Monitor the running statues of federated data cooperation tasks, i.e., the impact of device downtime or malfunctions when multiple computing infrastructures are assigned to work simultaneously.

Under this circumstance, it is indispensable to study the requirements and reference model for monitoring of federated data cooperation service in MEC in Future Network and aims to provide requirements， reference models and monitoring methods that are critical to the proper operation of federated data cooperation service in MEC.

6.2 Introduction to federated data cooperation service in MEC

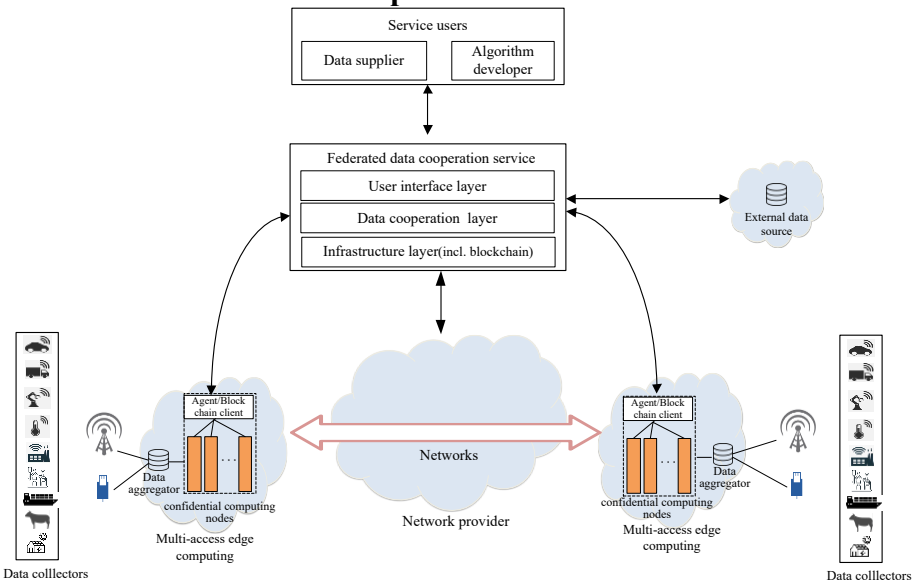

Figure 6.× Theoretical Model of Federated Data Cooperation Service in MEC defined in ITU-T Y.fdcs

The federated data cooperation service (FDCS) provides federated data cooperation among multiple participants in a decentralized manner either physically or logically on a neutral position in multi-access edge computing. The utilization of federated data cooperation service allows data suppliers, algorithm developers, and other entities (if any) to collaboratively work with each other through network without trust and interaction offline.

Figure 6-1 shows a theoretical model of federated data cooperation service in MEC by ITU-T Y.fdcs. Service users of federated data cooperation service encompass major participants of federated data cooperation, i.e., data suppliers and algorithm developers. Data suppliers are the provider of data which will be encrypted and shared to the multi-access edge computing sites, and the algorithm developers are the provider of the algorithms which are used to train the shared data through confidential computing nodes implemented in the multi-access edge computing. The federated data cooperation service function module is responsible for resources awareness and orchestration, identity authentication, and global control, etc. Masses of decentralized confidential computing nodes that encapsulate hardware-based TEE are in the multi-access edge computing sites, to provide confidential computing capabilities and storage capacities for scenarios such as data training, AI joint modelling, etc. during the federated data cooperation.

7 General requirement for monitoring of federated data cooperation service in MEC in Future Network

Contributor's note: This clause specifies general requirement for monitoring of federated data cooperation service in MEC in Future Network

7.1 Requirements of network performance monitoring of federated data cooperation service

Contributor's note: This clause specifies network performance monitoring of federated data cooperation service in MEC in Future Network. Network performance includes network delay, package loss, throughput, etc.

To be updated.

7.2 Requirements of resource monitoring of federated data cooperation service

Contributor's note: This clause specifies resources layer monitoring of federated data cooperation service in MEC in Future Network. i.e., Monitor the utilization, availability, and stability of computing resources and the remote verification or third-party verification statues of TEEs.

To be updated.

7.3 Requirements of operation monitoring of federated data cooperation service

Contributor's note: This clause specifies operation layer monitoring of federated data cooperation service in MEC in Future Network. i.e. Monitor the degree of participation of computing resources during a federated data cooperation task; monitor the running statues of federated data cooperation tasks.

To be updated.

8 Method of federated data cooperation service monitoring in MEC in Future Network

Contributor's note: This clause specifies Method of federated data cooperation service monitoring in MEC in Future Network.

8.1 Method of network performance monitoring of federated data cooperation service

To be updated.

8.2 Method of resources monitoring of federated data cooperation service

To be updated.

8.3 Method of operation monitoring of federated data cooperation service

To be updated.

9. Reference model for monitoring of federated data cooperation service in MEC in Future Network.

Contributor's note: This clause specifies the reference model for monitoring of federated data cooperation service in MEC in Future Network.

9.1 Reference Model for monitoring of federated data cooperation service

To be updated.

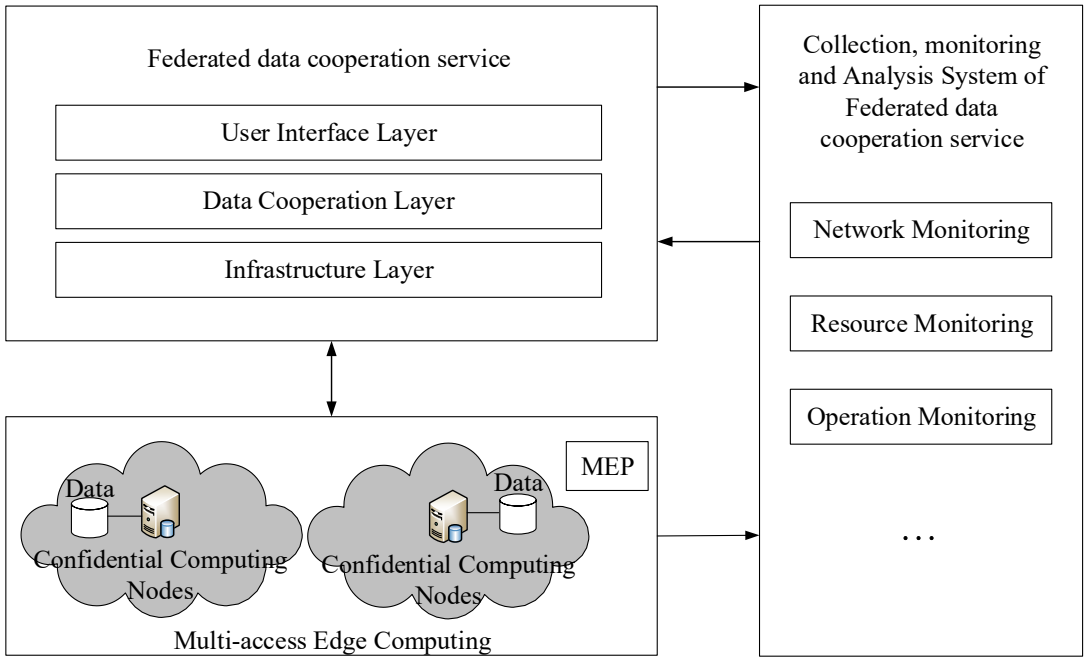

Figure 9.×. Reference Model for monitoring of Federated Data Cooperation Service in MEC

9.2 Interfaces requirements for monitoring of federated data cooperation service in MEC in Future Network

To be updated.

Bibliography

[b-ETSI GS MEC 001] ETSI GS MEC 001 (2019), Multi-access edge computing (MEC) terminology.

[b-ITU-T F.748.13] Recommendation F.748.13 (2021), Technical framework for a shared machine learning system

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