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“Signalling requirements and protocol procedures for two-way QoS mechanism  
between access networks and core networks in IMT-2020 network and beyond”  
(Geneva, 10-19 May 2023)

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**Abstract:** This is the output document of draft Recommendation Q.SP-twqos “Signalling requirements and protocol procedures for two-way QoS mechanism between access networks and core networks in IMT-2020 network and beyond”, based on the Q6/11 meeting, 10-19 May 2023

This draft Recommendation is based on C182 reviewed at Q6/11meeting (10-19 May 2023):

| Input | Title   | Source        | Result and action           |
|-------|---|---------------|-----------------------------|
| C182  | Proposal for initiating a new work item on signalling requirements and protocol procedures for two-way QoS mechanism between AN and CN in IMT-2020 network and beyond | China Telecom | Accepted with Modifications |

## **Draft new Recommendation ITU-T Q.SP-twqos**

### **Signalling requirements and protocol procedures for two-way QoS mechanism between access networks and core networks in IMT-2020 network and beyond**

#### **Summary**

This Recommendation specifies signalling requirements and protocol procedures for two-way QoS mechanism between access networks(AN) and core networks(CN) in IMT-2020 network and beyond. It includes signalling requirements, protocol procedures and message format for enhanced QoS negotiation mechanism between AN and CN.

#### **Keywords**

QoS negotiation mechanism, IMT-2020 network

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# **ITU-T Draft Recommendation Q.SP-twqos**

## **Signalling requirements and protocol procedures for two-way QoS mechanism between access networks and core networks in IMT-2020 network and beyond**

### **1. Scope**

This Recommendation specifies the Signalling Requirements and Protocol procedures for two-way QoS mechanism between AN and CN in IMT-2020 network and beyond.

The scope of this recommendation is as follows:

- Signalling requirements;
- Protocol procedures;
- Message format.

### **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.3102] Recommendation ITU-T Y.3102 (05/2018) *Framework of the IMT-2020 network*

[ITU-T Y.3107] Recommendation ITU-T Y.3107(08/2019) *Functional architecture for QoS assurance management in the IMT-2020 network*

### **3. Definitions**

#### **3.1 Terms defined elsewhere**

This Recommendation uses the following terms defined elsewhere:

TBD

#### **3.2 Terms defined in this Recommendation**

This Recommendation defines the following terms:

TBD

### **4. Abbreviations and acronyms**

This Recommendation uses the following abbreviations and acronyms:

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 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.

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 this Recommendation.

## 6. Background and motivations

Emerging services in Industrial Internet, smart city, healthcare, finance have proposed strict performance requirements, such as low bounded delay, low jitter, high reliability and so on. These services have two main characteristics comparing with the traditional services. On the one hand, emerging services require guaranteed quality rather than the statistical quality. For example, the motion control in industrial automation requires the delay have an upper bound, while the average delay is the performance factor in traditional services. On the other hand, the quantitative requirements are higher in the emerging service. For example, the end-to-end delay remote industrial control should be under 1ms within one workshop and 10ms between two workshops, the jitter should be less than 100us, and the reliability should be greater than 99.999%. To satisfy the service requirements, the QoS assurance becomes the key mechanism in IMT-2020 network and beyond.

The existing QoS mechanism in IMT-2020 network is a one-way mechanism controlled by the core network (CN). Specifically, CN is responsible for the configuration of QoS policies and parameters. The CN sends a QoS policy to the access network (AN) and user equipment (UE). The AN and UE can accept or reject the policy, but the two parties cannot negotiate with the CN. Similarly, CN does not consider the status of AN and UE when adjusting QoS policies. In this QoS mechanism, AN and UE are excluded from the QoS policy decision, which may lead to the mismatch between the QoS policy and the air interface. It can reduce the efficiency of data transmission in the user plane, and the QoS could not be guaranteed.

Moreover, with the significant increase in the number and type of UEs, the service types and requirements are more diverse. Therefore, we should support more parameters for QoS assurance (such as the variation range of packet delay, maximum disorder, maximum continuous packet loss, etc.), which is closer to the needs of the service.

In order to meet these requirements, we suggest to continue the research of the QoS assurance especially concerning mechanism with negotiation between the AN and CN in IMT-2020 networks and beyond.

## 7. Overview

To satisfy the strict performance requirements of emerging services, QoS assurance becomes the key mechanism in IMT-2020 network. QoS assurance is functionalities or mechanisms that enable service providers to make statements with a degree of confidence that the service meets the quality characteristics or objectives defined elsewhere.

The QoS mechanism in IMT-2020 Network is designed based on network infrastructure. The four main functional IMT-2020 parts are CN, AN, UE, and application function. The functional parts of IMT-2020 network except application function are divided into control plane and data plane. Considering the framework of the IMT-2020 network defined in ITU-T Y.3102 as shown in Figure

7-1, the IMT-2020 network performs QoS mechanism by using AN, CN, and appropriate network functions and functional entities.

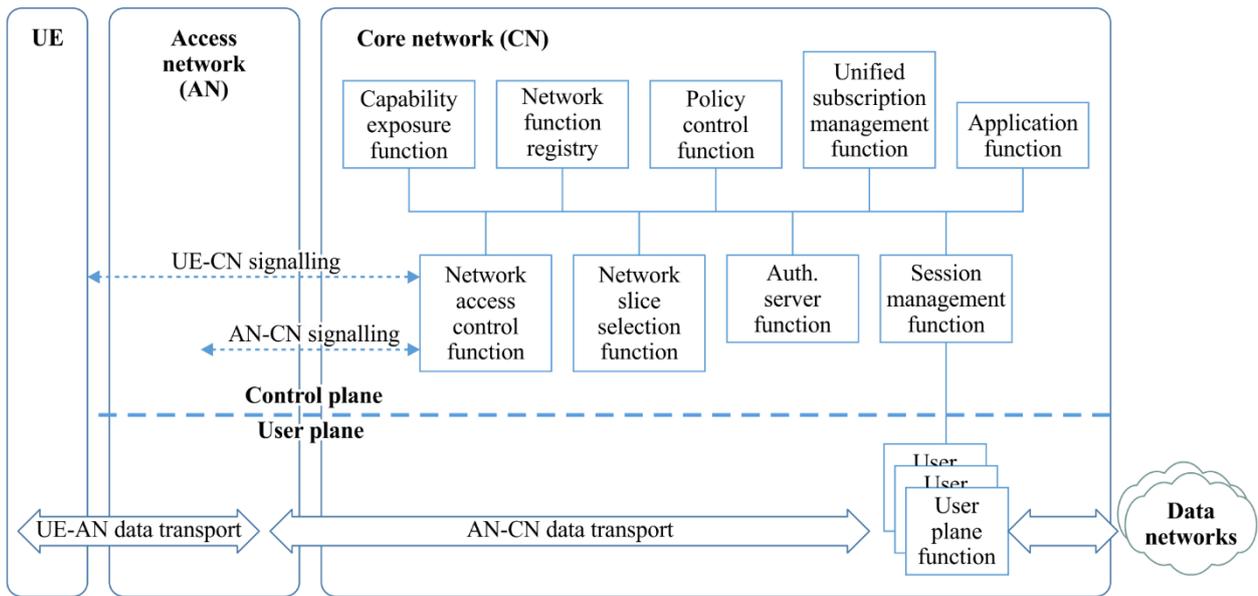


Figure 7-1 IMT-2020 Architecture

In IMT-2020 network, the QoS mechanism is controlled by the CN. Specifically, CN is responsible for the configuration of QoS policies and parameters (Figure 7-2). The CN sends a QoS policy to the access AN and UE. The AN and UE can accept or reject the policy, but the two parts cannot negotiate with the CN. Similarly, CN does not consider the status of AN and UE when adjusting QoS policies. In this one-way QoS mechanism, AN and UE are excluded from the QoS policy decision, which may lead to the mismatch between the QoS policy and the air interface. It can reduce the efficiency of data transmission in the user plane, and the QoS could not always be guaranteed, especially in the network congestion scenario.

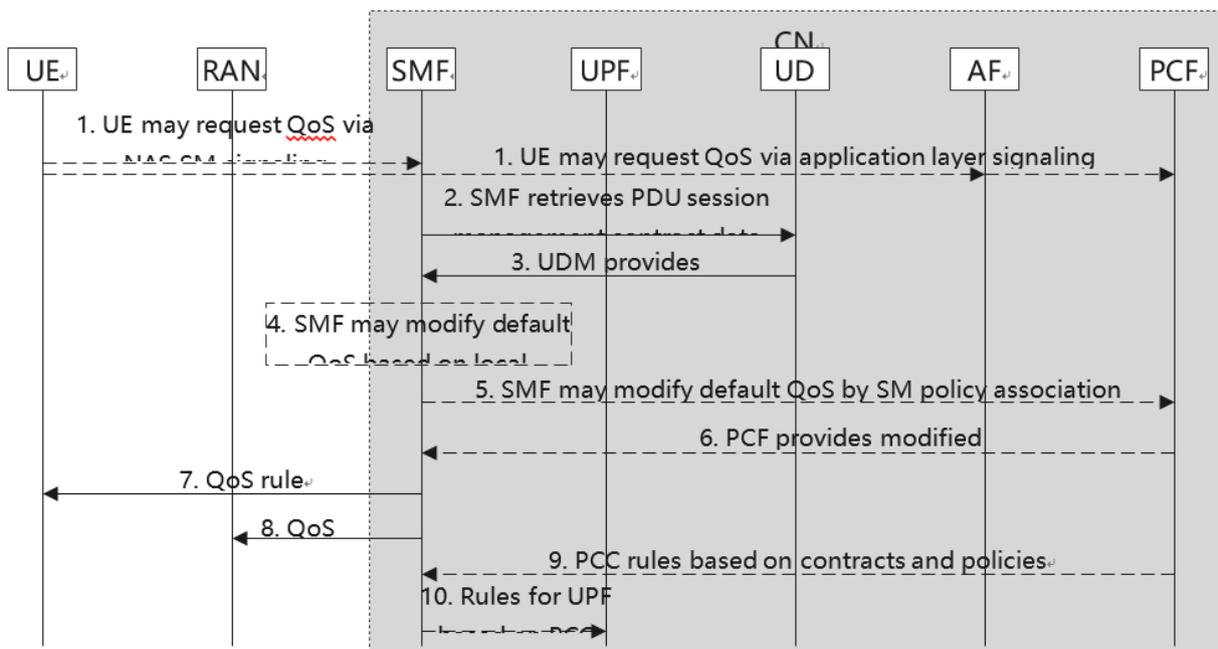


Figure 7-2 IMT-2020 Qos procedures

To handle the issue of the one-way QoS mechanism, the IMT-2020 network and beyond is suggested to have a two-way QoS mechanism. The two-way QoS mechanism builds the negotiation between AN and CN such that the CN, AN and UE can all participate in the QoS policy decision.

Editor's Note: Enhancements of control plane need to be added to support two-way QoS mechanism.

## **8. Signalling requirements for two-way QoS mechanism in IMT-2020 network and beyond**

*[Editor's Note] This clause specifies the signalling requirements for two-way QoS mechanism in IMT-2020 network and beyond.*

### **a) Signalling requirements for UE QoS information reporting**

The messages from UE to RAN/CN aim to deliver the QoS information related to service characteristics and requirements to RAN/CN, as the reference or recommendation of QoS decision-making for RAN/CN.

### **b) Signalling requirements for RAN QoS information reporting**

The message from RAN to CN aims to deliver the QoS information related to air interface states to RAN/CN, as the reference or recommendation of QoS decision-making for CN.

### **c) Signalling requirements for QoS policy distributing**

The messages from CN to UE/RAN aim to distribute QoS policy to guide UE/RAN on how to transmit UL/DL QoS flows. QoS rule determines whether and how UE marks and sends UL packets, and QoS profile determines how RAN maps QFIs and DRBs.

## **9. Protocol procedures for two-way QoS mechanism in IMT-2020 network and beyond**

*[Editor's Note] This clause specifies the protocol procedures for two-way QoS mechanism in IMT-2020 network and beyond, contributions are welcomed.*

## **10. Message format for two-way QoS mechanism in IMT-2020 network and beyond**

*[Editor's Note] This clause specifies the signalling flow for two-way QoS mechanism in IMT-2020 network and beyond, contributions are welcomed.*

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