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SERIES Q: SWITCHING AND SIGNALLING, AND
ASSOCIATED MEASUREMENTS AND TESTS

Signalling requirements and protocols for IMT-2020 –
Protocols for IMT-2020

Protocol for managing intelligent network slicing with AI-assisted analysis in IMT-2020 networks

Recommendation ITU-T Q.5023

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Recommendation ITU-T Q.5023

Protocol for managing intelligent network slicing with AI-assisted analysis in IMT-2020 networks

Summary

Recommendation ITU-T Q.5023 specifies the protocol for managing intelligent network slicing with AI-assisted network analysis function in International Mobile Telecommunications (IMT)-2020 networks. It describes the architectural concept of intelligent network slicing application programming interfaces (APIs) and management systems, reference points among relevant functional elements, signalling flows over each reference point, and message formats with detailed information.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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AI-assisted, API management, IMT-2020, network slice.

* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

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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.

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Recommendation ITU-T Q.5023

Protocol for managing intelligent network slicing with AI-assisted analysis in IMT-2020 networks

1 Scope

This Recommendation specifies the protocol for managing intelligent network slicing with AI-assisted network analysis function in IMT-2020 networks. It describes the architectural concept of intelligent network slicing application programming interface (APIs) and management system, reference points among relevant functional elements, signalling flows over each reference point, and message formats with detail information.

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.

None.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 IMT-2020 [b-ITU-T Y.3100]: (Based on [b-ITU-R M.2083] Systems, system components, and related technologies that provide far more enhanced capabilities than those described in [b-ITU-R M.1645].

3.1.2 management [b-ITU-T Y.3100]: In the context of IMT-2020, the processes aiming at fulfilment, assurance, and billing of services, network functions, and resources in both physical and virtual infrastructure including compute, storage, and network resources.

3.1.3 network function [b-ITU-T Y.3100]: In the context of IMT-2020, a processing function in a network.

3.1.4 network slice [b-ITU-T Y.3100]: A logical network that provides specific network capabilities and network characteristics.

3.1.5 third party (3rd party) [b-ITU-T Y.3100]: In the context of IMT-2020, with respect to a given network operator and network end-users, an entity which consumes network capabilities and/or provides applications and/or services.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 data analysis function (DAF): A network function that can collect, analyse, and provide data from/to International Mobile Telecommunications 2020 (IMT-2020) core network functions, network management and third-party applications.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

API	Application Programming Interface
DAF	Data Analysis Functions
IE	Information Element
IMT	International Mobile Telecommunications
MOS	Mean Opinion Score
NF	Network Function
PCF	Policy Control Function
QoE	Quality of Experience
SLA	Service Level Agreement

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement that 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 that 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.

The letter "M" indicates the element is mandatory. The letter "O" indicates the element is optional. The letter "C" indicates the element is conditional.

6 Overview

Intelligent network slicing with AI-assisted functions is capable of allocating limited resources to meet the service level agreement (SLA) of slicing users in real time dynamically. It is necessary to develop an intelligent network slicing API framework which makes the IMT-2020 network more efficient and flexible. The framework includes common aspects and some functional APIs which provide AI-assisted functions.

7 API architecture and definition

Figure 7-1 shows the architectural concept of intelligent network slicing APIs and management system which includes IMT-2020 network, network management, data analysis function (DAF) and API management function. It also shows the relationship between the data analysis function with the IMT-2020 core network and related network functions.

Data analysis function provides functionalities to collect data, data analysis, mean opinion score (MOS) training and QoE (Quality of Experience) calculation, which will assist in meeting the requirements of network slicing users.

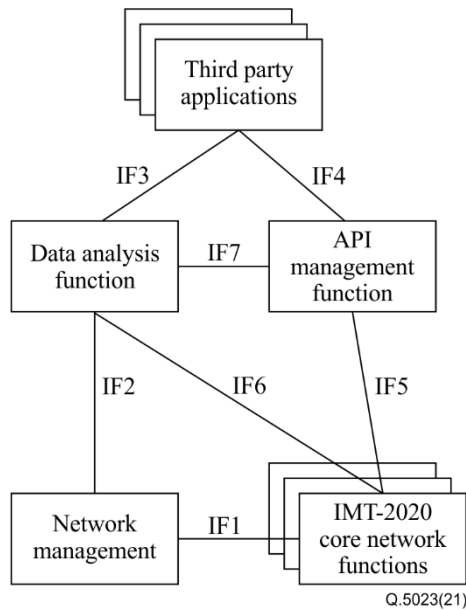


Figure 7-1 – Architectural concept of intelligent network slicing API system

The 3rd party applications can provide service or application related data to the data analysis function by using Application_Data_Collection service.

The API management function is mainly responsible for the management and orchestration of intelligent network slicing APIs, such as Application_Data_Collection API.

The IF1 reference point exists between the network management and the IMT-2020 core network functions (NFs). It supports the management and orchestration of NFs, such as performance related data reporting and NFs configuration policies distribution.

The IF2 reference point exists between the data analysis function and the network management. Data of the network slices monitored by the network management could be sent to the data analysis function by IF2, and the network data analysis results are notified to the network management based on subscription.

The IF3 reference point is the northbound interface that exists between the data analysis function and the third-party applications. It supports slice service-related data collection, and data analysis results exposed to the third-party applications.

The IF4 reference point is the northbound interface that exists between the API management function and third-party applications. It supports discovery, modification, deletion, and other management functions of API provided by 3rd party applications.

The IF5 reference point exists between the API management and NFs. It supports the management of NF capability exposure related APIs.

The IF6 reference point exists between the data analysis function and NFs. It supports the network slice data collection and analysis results offer to IMT-2020 core networks.

The IF7 reference point exists between the API management function and the data analysis function. It supports the management of data analysis exposure related API.

8 Signalling flow

This clause describes the signalling flow procedures in data collection and analysis, MOS training, QoE calculation, etc.

8.1 Data collection flow

This clause describes the signalling flow of data collection which is fulfilled by the data analysis function.

The data collection procedures can be initiated by the data analysis function, 3rd party applications and IMT-2020 core network functions.

8.1.1 DAF triggered periodic data collection flow

Figures 8-1 to 8-3 describe the DAF triggered periodic data collection flow.

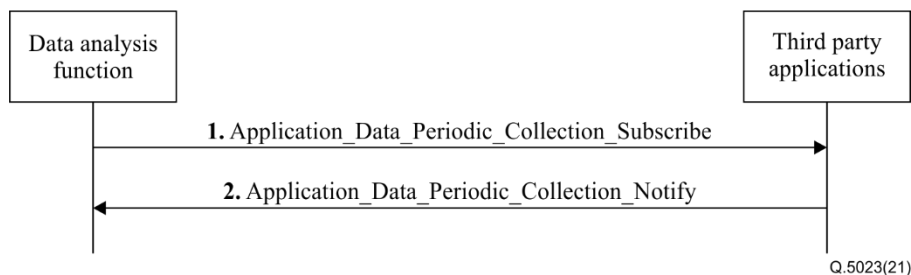


Figure 8-1 – Signalling flow for subscribing periodic data collection from 3rd party applications

1. Data analysis function subscribes the application service data from 3rd party applications by invoking `Application_Data_Periodic_Collection_Subscribe` service to create a new subscription and modify an existing subscription. It includes UE level sample data, application information and user information.
2. The 3rd party applications notify the data analysis function by invoking `Application_Data_Periodic_Collection_Notify` service operation. It includes user experience data and related information.

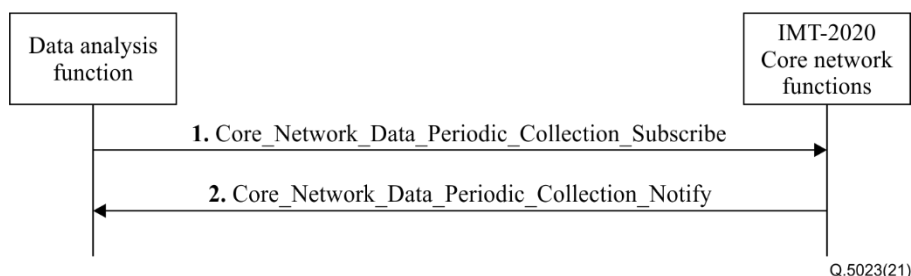


Figure 8-2 – Signalling flow for subscribing periodic data collection from IMT-2020 core network

1. Data analysis function subscribes to the network function service data from IMT-2020 core network functions by invoking `Core_Network_Data_Periodic_Collection_Subscribe` service to create a new subscription and modify an existing subscription. It includes NF level performance measurement data and network level KPI data.
2. The core network functions notify the data analysis function by invoking the `Core_Network_Data_Periodic_Collection_Notify` service operation.

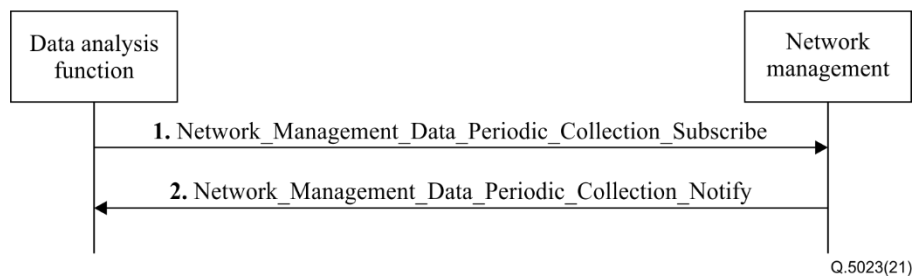


Figure 8-3 – Signalling flow for subscribing periodic data collection from network management

1. Data analysis function subscribes the service data from network management by invoking Network_Management_Data_Periodic_Collection_Subscribe service to create a new subscription and modify an existing subscription. It includes sample data, NF level performance measurement data, network coverage area, number of subscribers, fault supervision data, resource usage data and network level KPI data.
2. The network management notify the data analysis function by invoking Network_Management_Data_Periodic_Collection_Notify service operation.

8.1.2 DAF triggered data collection flow

Figures 8-4 to 8-6 describe the DAF triggered data collection flow.

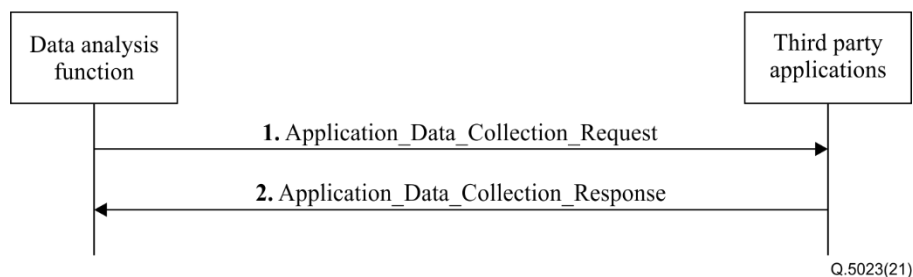


Figure 8-4 –DAF triggered signalling flow for data collection from 3rd party applications

1. Data analysis function requests for application service data from 3rd party applications by invoking Application_Data_Collection_Request. It includes UE level sample data, application information and user information.
2. The 3rd party applications send a response to the data analysis function by invoking Application_Data_Collection_Response. It includes user experience data and related information.

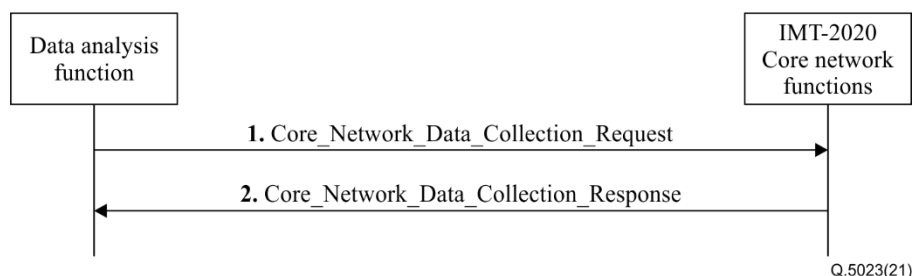


Figure 8-5 – DAF triggered signalling flow for data collection from IMT-2020 core network

1. Data analysis function requests for network function service data from IMT-2020 core network functions by invoking Core_Network_Data_Collection_Request. It includes NF level performance measurement data and network level KPI data, like data bandwidth, data