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Recommendation

ITU-T Y.3205 (12/2023)

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

Future networks

Fixed, mobile and satellite convergence – Requirements of integrated user-centric service units

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Recommendation ITU-T Y.3205

Fixed, mobile and satellite convergence – Requirements of integrated user-centric service units

Summary

An integrated user-centric service unit (IUSU) supports end users to define network and service capability profiles according to their own necessities. Fixed, mobile and satellite convergence (FMSC) is the capability of IUSU in supporting multiple access technologies used by various devices. Recommendation ITU-T Y.3205 specifies the scenarios, general characteristics, requirements, framework and security considerations of IUSU for FMSC, in the context of IMT-2020 networks and beyond.

History *

Edition	Recommendation	Approval	Study Group	Unique ID
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Keywords

FMSC, IMT-2020, integrated user-centric service unit, satellite network.

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Fixed, mobile and satellite convergence – Requirements of integrated user-centric service units

1 Scope

This Recommendation addresses the requirements and framework for integrated user-centric service units for fixed, mobile and satellite convergence (FMSC) in the context of the IMT-2020 networks and beyond.

The scope of this Recommendation includes:

- Overview of IUSU for FMSC in IMT-2020 networks and beyond;
- General characteristics of IUSU for FMSC in IMT-2020 networks and beyond;
- Requirements of IUSU-enabled capabilities for FMSC in IMT-2020 networks and beyond;
- Framework for IUSU-enabled capability for FMSC in IMT-2020 networks and beyond;
- Security considerations.

Some relevant typical scenarios are provided in Appendix I.

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 E.164] Recommendation ITU-T E.164 (2010), *The international public telecommunication numbering plan.*

[ITU-T Y.3101] Recommendation ITU-T Y.3101 (2018), *Requirements of the IMT-2020 network.*

[ITU-T Y.3200] Recommendation ITU-T Y.3200 (2022), *Fixed, mobile and satellite convergence – Requirements for IMT-2020 networks and beyond.*

[ITU-T Y.3201] Recommendation ITU-T Y.3201 (2023), *Fixed, mobile and satellite convergence – Framework for IMT-2020 networks and beyond*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 fixed, mobile and satellite convergence [ITU-T Y.3200]: The capabilities that provide services and applications to end users regardless of the fixed, mobile or satellite access technologies being used independently of the users' location.

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

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 integrated user-centric service unit (IUSU): A network entity that provides selected network functions and service capabilities for specific users of fixed, mobile and satellite convergence in IMT-2020 networks and beyond.

NOTE – There are two types of IUSU that provide services to end users. One is private IUSU (Pri-IUSU), and the other is public IUSU (Pub-IUSU). Generally, Pri-IUSU is created and managed by users in order to provide network and service capabilities for their specific devices. The Pub-IUSU provides services to users who are unable to obtain services from a Pri-IUSU. The Pub-IUSU could be a Pri-IUSU shared by users, or it could be created and managed by an operator.

3.2.2 network and service capabilities depository (NSCD): A network entity that supports the storage and downloading of network and service capabilities required by the IUSUs.

NOTE – The network and service capabilities required by the IUSUs include access control functions, mobility management, session management, QoS management and service charging.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ASF	Authentication Server Function
CEF	Capability Exposure Function
CRM	Customer Relationship Management
D2D	Device to Device
FMSC	Fixed, Mobile and Satellite Convergence
IUSU	Integrated User-centric Service Unit
IUSU-UPF	Integrated User-centric Service Unit User Profile Function
NACF	Network Access Control Function
NSCD	Network and Service Capabilities Depository
NSFD	Network and Service Functions Depository
PCF	Policy Control Function
PON	Passive Optical Network
Pri-IUSU	Private Integrated User-centric Service Unit
Pub-IUSU	Public Integrated User-centric Service Unit
QoS	Quality of Service
SIP	Session Initiation Protocol
SMF	Session Management Function
UE	User Equipment
UPF	User Plane Function
URI	Uniform Resource Identifier
USM	Unified Subscription Management Function
Wi-Fi	Wireless Fidelity

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 keyword "optional" indicates 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 Overview of integrated user-centric service unit for FMSC in IMT-2020 networks and beyond

In existing networks, services and applications are mainly provided to end users through centralized networks and application servers operated and managed by network operators or service providers. End users can only use the specified capability profiles and cannot define their own network and service capability profiles on demand. The centralized deployment of network and service is not flexible and scalable enough to satisfy the personalized and diversified requirements on service and applications of end users. Therefore, an integrated user-centric service unit (IUSU) is introduced to support end users to define network and service capability profiles according to their own necessities.

In the IMT-2020 networks and beyond, the services provisioning and connectivity of multiple items of user equipment (UEs) provided to a designated user could be accomplished by an IUSU. The IUSU refers to a service unit created and managed by user or operator with selected network functions and service capabilities of the IMT-2020 networks and beyond.

Figure 6-1 illustrates the overview for the IUSU for FMSC in IMT-2020 networks and beyond. In the converged control layer, the converged core network functions are provided by the network and service capabilities depository (NSCD), IUSU and IUSU-user profile function (IUSU-UPF). The NSCD is responsible for storing various network and service capabilities required by the IUSUs, such as access control functions, mobility management, session management, QoS management and service charging. The IUSU downloads the selected network and service capabilities from the NSCD and deploys personalized applications. Then the IUSU could provide the selected network functions, service capabilities and applications to the user's devices in different scenarios. After the IUSU completes initialization, the NSCD is not involved in providing subsequent services to end users. The IUSU-UPF contains the IUSU-user profile in support of the user authentication and routing among IUSUs. The centralized applications could be provided to IUSU users through the centralized application layer as needed.

The IUSU of IMT-2020 networks and beyond supports multiple access technologies used by various devices. The UEs used in cities and towns access IMT-2020 networks and beyond via PON, Wi-Fi, and terrestrial networks. The UEs used in oceans, forest and deserts access the core network via satellite. The UEs used in travelling nodes and rural areas may use PON, Wi-Fi, terrestrial networks and satellite. Taking into account the key elements for the integration of satellite systems including the persistent quality of service and intelligent routing support specified in [b-ITU-R M.2460-0], this Recommendation specifies the requirements and framework for IUSU for FMSC in IMT-2020 networks and beyond.

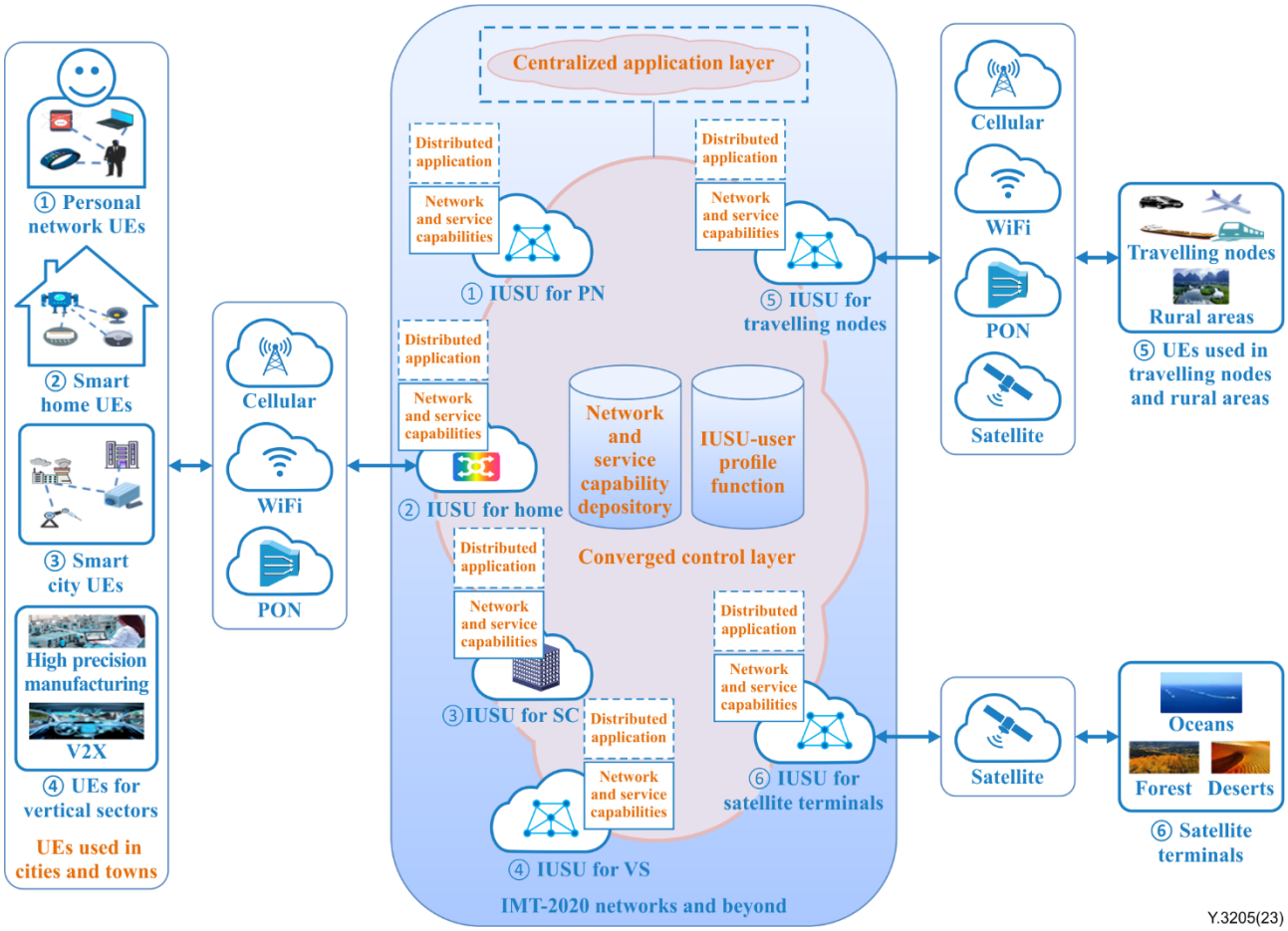

Figure 6-1 – Overview of integrated user-centric service unit for FMSC in IMT-2020 networks and beyond

7 General characteristics of IUSU for FMSC in IMT-2020 networks and beyond

7.1 Support of service and network capabilities

IUSU supports access of UEs, communication among UEs of inter- and intra-IUSUs, and providing service and applications to IUSU users. It supports multiple access technologies by utilizing wireless and wired, terrestrial and non-terrestrial access to improve the resource efficiency and service experience. The UEs can communicate with each other and obtain the required application and service by accessing IUSU.

7.2 Support of virtualization of network entities

IUSU is an integrated virtualized network element. It consists of the applications, network and service capabilities which could be orchestrated by IUSU users.

7.3 Support of self-provisioning and management by user

An IUSU should be created and managed by public users or vertical industry sectors in accordance with their own necessities. The user could download the selected service and network capabilities on demand from the service and network capabilities depository of the operator to create a new IUSU. The service and network capabilities of an IUSU could be modified by the user on demand.

7.4 Support of interaction with capability depository and user data depository

The capability depository provides candidate service and network capabilities which could be downloaded by the IUSU to achieve fast service provisioning. The IUSU-user data depository stores the authentication information, registration status and routing data of the IUSU to guarantee the connection between IUSUs.

8 Requirements of IUSU-enabled capabilities in IMT-2020 networks and beyond

8.1 Capability requirements for IUSU

8.1.1 Requirements for service capabilities

Regarding the services are provided by distributed IUSUs, the following service capabilities are required for IUSUs in IMT-2020 networks and beyond.

- It is required to support the selected services in accordance with the user's requirements. The candidate services are specified in [ITU-T Y.3200].
- It is required to support the awareness and policy management of the QoS of supported services and applications in multiple access scenarios.
- It is required to support the service continuity during switching between different IUSUs, such as switching between Pri-IUSU and Pub-IUSU.
- It is required to support the charging for massive services in accordance with charging policies required by operators.
- It is required to support the sharing of service and application among IUSUs to facilitate the service diversity in IMT-2020 networks and beyond. An IUSU with sharing applications allows other IUSUs to discover and invoke their shared applications.

8.1.2 Requirements for converged network functions

The IUSU should download the required network functions from the NSCD and provide access and service control functions to the correspondent UEs.

8.1.2.1 Access control functions

The following capabilities are required regarding access control with UEs:

a) It is required to support the selected access control functions in accordance with the IUSU's UE access requirements. The candidate access technologies include PON, Wi-Fi, terrestrial networks and satellite.

b) It is required to support the authentication with UEs in the registration process. The IUSU sends a dynamic data update request to IUSU-UPF with the authenticated UE's ITU-T E.164 number. As a result, the IUSU-UPF updates and stores the dynamic data, such as connection data for real time service etc. and returns the successful response to the IUSU. The connection data includes the UE's ITU-T E.164 number, registered IUSU's identity and the corresponding IP address. The IUSU stores the corresponding IP address related to the UE's ITU-T E.164 number after returning registration successful response to UE.

c) It is required to support connecting UE to an IUSU which can provide the required services.

In accordance with the register request of the UE, it is required to support registration of the UE to a Pri-IUSU or a Pub-IUSU which provides services to the user accordingly.

When a Pri-IUSU identifier is included in the register request, the access network and IUSU which receive the register request can recognize the identifier, and act as follows:

i) If the access network determines that the Pri-IUSU is reachable, the register request should be sent to the Pri-IUSU. The Pri-IUSU should provide services to the user accordingly.

ii) If the access network determines that the Pri-IUSU is unreachable, the register request should be sent to an appropriate Pub-IUSU in accordance with the operator's policy. If the Pub-IUSU supports home routing, it should transfer the register request to the user's Pri-IUSU, which should provide the services to the user. If the Pub-IUSU does not support home routing, it should provide services to the user directly.

NOTE – The access network is required to support the mapping of the identifier and IP address of a Pri-IUSU to determine the reachability of the Pri-IUSU. An Pri-IUSU is determined to be reachable when it is included in the reachable Pri-IUSU list stored in the access network or the IP address of the Pri-IUSU is reachable. If a Pri-IUSU is not included in the reachable Pri-IUSU list and the IP address of the Pri-IUSU is unreachable, the Pri-IUSU should be determined to be unreachable.

If the Pri-IUSU identifier is not included in the register request, the register request should be sent to an appropriate Pub-IUSU in accordance with the operator's policy. The Pub-IUSU should provide services to the user directly.

8.1.2.2 Network and service control functions

The following capabilities are required:

a) It is required to support the requirements of converged network functions addressed in [ITU-T Y.3200] in accordance with the user's requirements.

b) It is required to support the authentication mechanisms of UE for security and privacy purposes.

c) It is required to support the UE profile which manages the identity, category, service capabilities and authentication information of UEs.

d) It is required to support intelligent service routing with precise identification of user and service to provide D2D, IUSU internal and external connections.

e) It is required to support the connection for real time service as following:

i) When the originating IUSU receives a service connection request from an originating UE with the ITU-T E.164 number of the terminating UE, it sends a dynamic routing data query request with the number to IUSU-UPF. It then receives the query result based on the stored dynamic data with the terminating UE's session initiating protocol (SIP) URI, which includes the terminating UE's ITU-T E.164 number and the identity of the terminating IUSU expressed as its domain.

ii) The originating IUSU sends an IP address query request to the IUSU-UPF with the identity of the terminating IUSU and receives the corresponding IP address of the terminating IUSU.

iii) Based on the received IP address, the originating IUSU sends a service connection request to the terminating IUSU with the terminating number.

iv) The terminating IUSU finds the IP address of the terminating UE based on the relationship between them stored in the registration process and forwards the request to the UE based on the IP address. Then it receives the successful response from the terminating UE and forwards it to the originating IUSU.

v) After the originating IUSU receives the successful response from the terminating UE via the terminating IUSU, it forwards it to the originating UE and establishes the service connection of two UEs via the terminating IUSU.

NOTE – The originating UE registers to the originating IUSU and the terminating UE registers to the terminating IUSU before the connection of the real time service. And the dynamic data for UE's ITU-T E.164 numbers was updated and stored in the IUSU-UPF in the registration process.

8.1.3 Requirements for self-provisioning and management

In support of the autonomous creation and management of an IUSU, the following capabilities are required:

- It is required to support IUSU autonomous creation and corresponding user identifier authentication mechanisms.
- It is required to support the selection and downloading of network functions and service capabilities provided in NSCD in accordance with the IUSU's service and network control requirements.
- It is required to support the UE profile which manages the identity, service capabilities, authentication information and service status of UEs with access permissions.
- It is recommended that an IUSU provides hardware virtualization capability in order to support software independence from the IUSU's hardware.

8.2 Capability requirements for NSCD

The NSCD provides common network and service capabilities for IUSUs. In order to install and maintain IUSUs flexibly and conveniently, the following capabilities are required for NSCD:

- It is required to support IUSU profile management to satisfy capabilities required for different category of IUSUs. The categories may include IUSU for smart home, IUSU for the vertical sector, IUSU for moving nodes, etc. When creating a new IUSU, the user can select and download an IUSU profile in accordance with the required network and service capabilities.
- It is required to support the authentication of IUSU-user. When receiving a capability downloading request from a user, the NSCD performs authentication with the user via interaction with IUSU-UPF and only the authenticated user can download the IUSU profile and relevant capabilities.
- It is required to support the storage and updating of the common network and service capabilities required by IUSUs.
- It is optional to support the storage and updating of the common applications for IUSUs.

8.3 Capability requirements for IUSU-user profile

The IUSU-user profile contains the IUSU-user data and processes data access requests. The following capabilities are required for the IUSU-user profile:

- It is required to support the IUSU-user profile which manages the identification and addressing, service capabilities, authentication information and service status of IUSUs.
- It is required to support the verification of IUSU-user via interaction with the NSCD during the IUSU capability downloading procedures.
- It is required to support the routing between IUSUs through the mapping of IUSU identification and addressing information.
- It is required to support user's dynamic data, which is used for real time service connection etc.

9 Framework of IUSU-enabled capability

9.1 Overview

The overall framework of FMSC in IMT-2020 networks and beyond depicted in Figure 9-1 is specified in [ITU-T Y.3201].

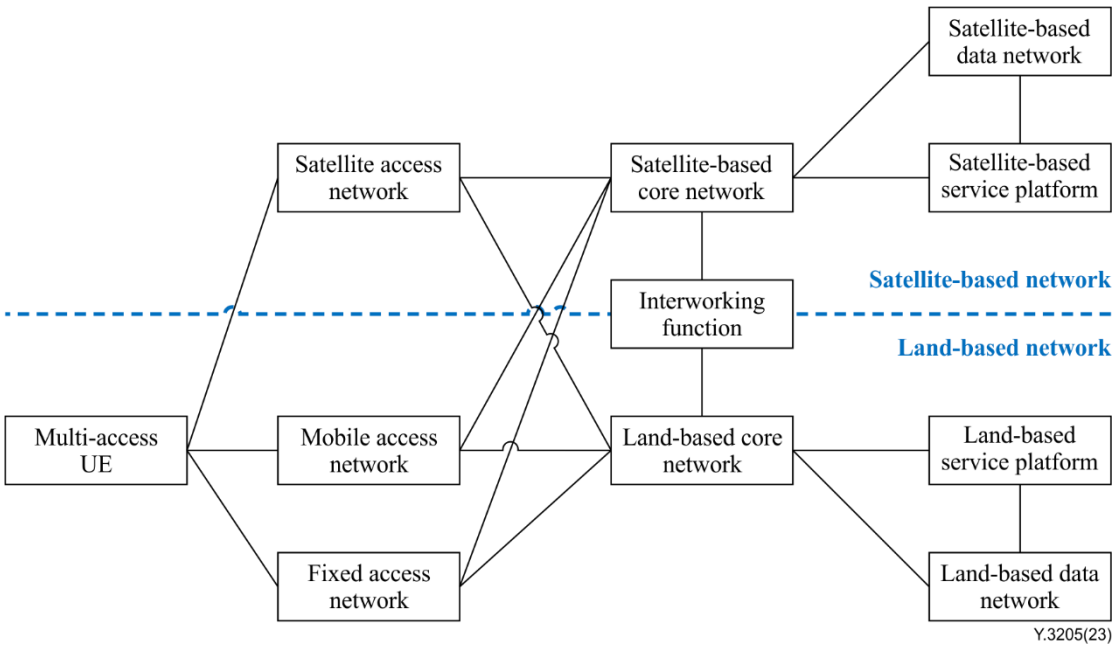

Figure 9-1 – Overall framework of fixed, mobile and satellite convergence

This Recommendation specifies the land-based core network functions that are provided by IUSU-enabled capabilities including NSCD, IUSU and IUSU-UPF.

NOTE – The satellite-based networks provided by IUSU-enabled capabilities are out of the scope of this Recommendation.

The framework of IUSU-enabled land-based core network for FMSC in IMT-2020 networks and beyond is illustrated in Figure 9-2.

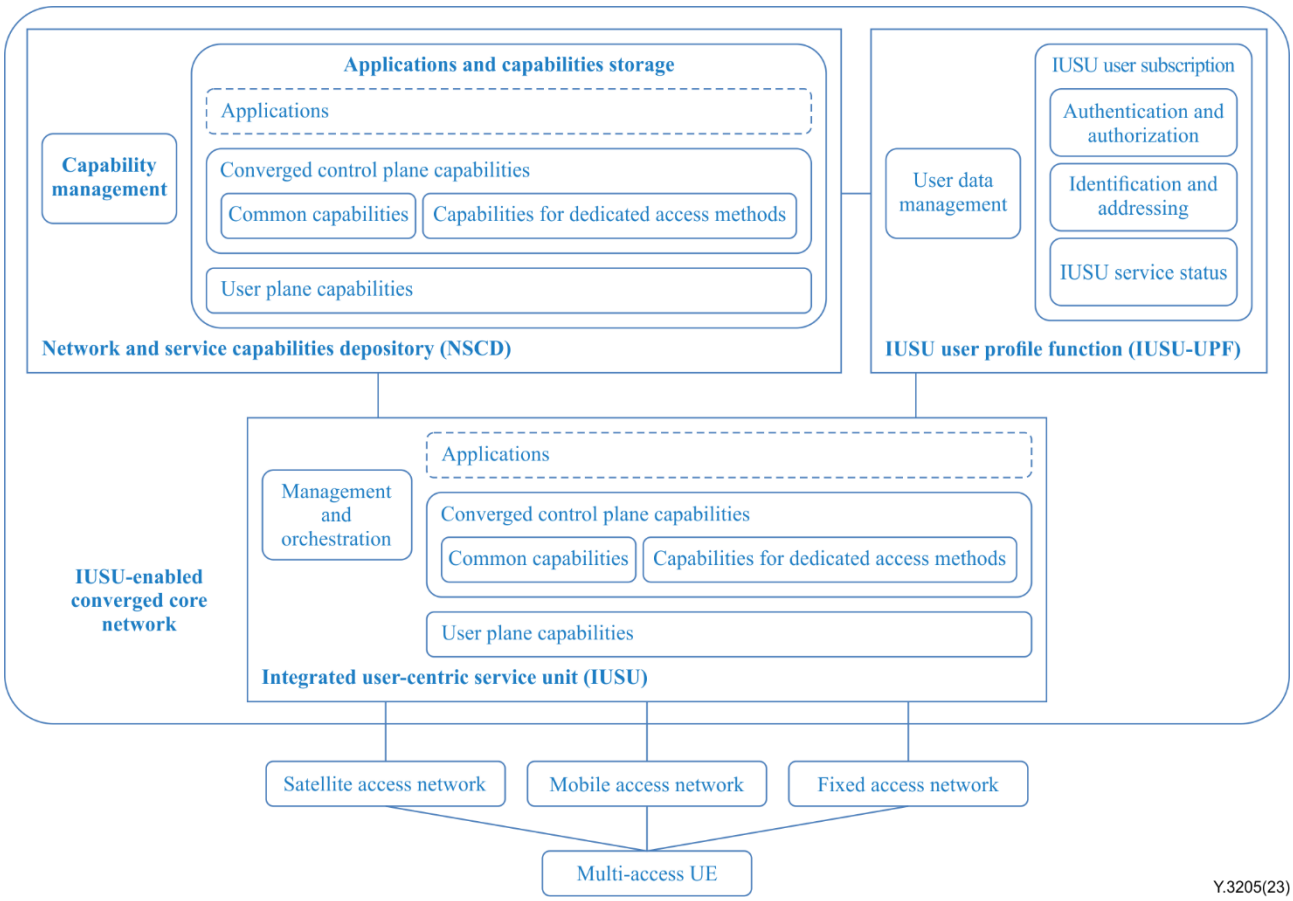

Figure 9-2 – Framework of IUSU-enabled converged core network for FMSC in IMT-2020 networks and beyond

The capabilities in support of IUSU in IMT-2020 networks and beyond are contained in the NCSD, IUSU-UPF and IUSU.

The NSCD manages and stores network and service capabilities for downloading by IUSUs. It processes the capability downloading request of the IUSU and interacts with the IUSU-UPF for IUSU-user authentication and downloading authorization. The capabilities for downloading by IUSU include control plane and user plane capabilities. The capability management is responsible for the management of the capabilities including adding, deleting and modifying capabilities, etc. The applications for downloading could be stored in the NSCD as needed.

The IUSU-UPF manages and stores the IUSU-user profile in support of the user authentication, service authorization and routing among IUSUs, etc. It processes the IUSU-user authentication request of the NSCD for the capability of downloading authorization. It processes the routing query request of IUSU in support of communication between IUSUs.

The IUSU downloads the selected network and service capabilities from the NSCD and deploys personalized applications. Then the IUSU provides the registration and telecommunication service to the end users in different scenarios.

9.2 Capability framework of NSCD

The capabilities of NSCD are illustrated in Figure 9-3. The NSCD provides capability storage and management functions in support of IUSU initiation.

The capability management function is responsible for the management of applications and capabilities for downloading by IUSUs, including the capability of adding, deleting and modifying.

It also processes the capability downloading request of the IUSU and interacts with the IUSU-UPF for IUSU-user authentication and downloading authorization.

The capability storage function stores the applications and capabilities for downloading by the IUSU. It contains the applications, control plane and user plane capabilities. The NACF, SMF, PCF, CEF, USM, ASF and UPF for FMSC are addressed in [ITU-T Y.3201]. The IP multimedia service control function supports the voice and video services over the IUSU-enabled land-based core network for FMSC in IMT-2020 networks and beyond.

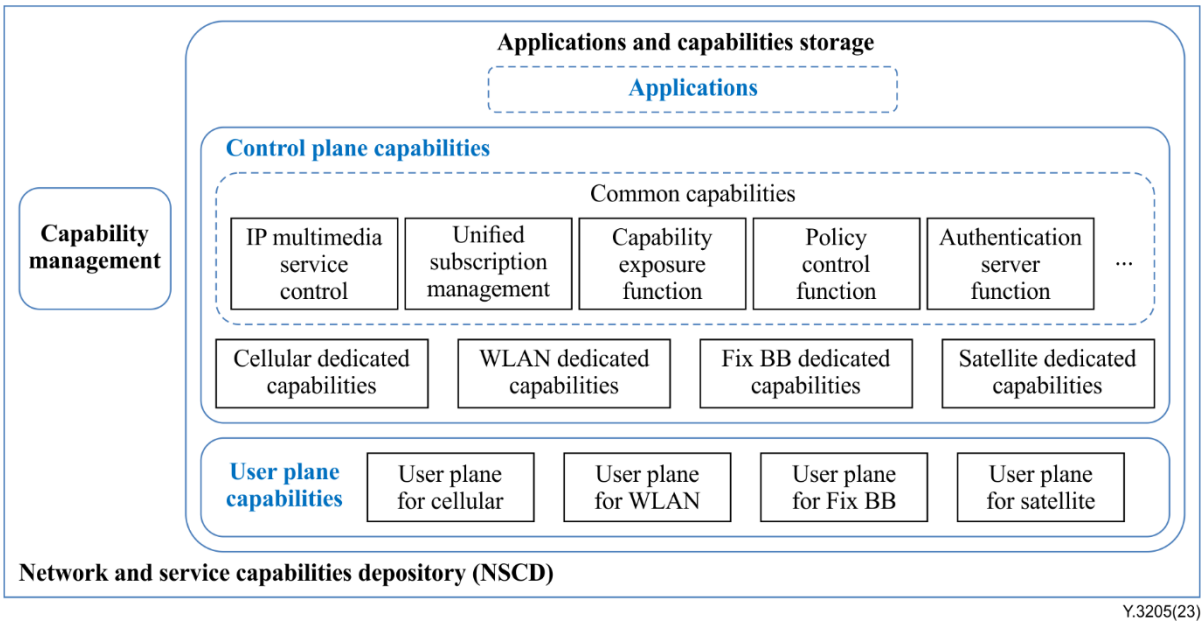

Figure 9-3 – Capability framework of NSCD

9.3 Capability framework of IUSU-UPF

The capabilities of the IUSU-UPF are illustrated in Figure 9-4. The IUSU-UPF provides user data management and IUSU-user subscription functions.

The user data management function interacts with the IUSU customer relationship management (CRM) in support of the management of the user subscription data profile, including adding, deleting and modifying.

The IUSU-user subscription function provides the IUSU-user service subscription, user authentication, service authorization, identification and addressing of IUSU for routing, and the management of the IUSU service status.

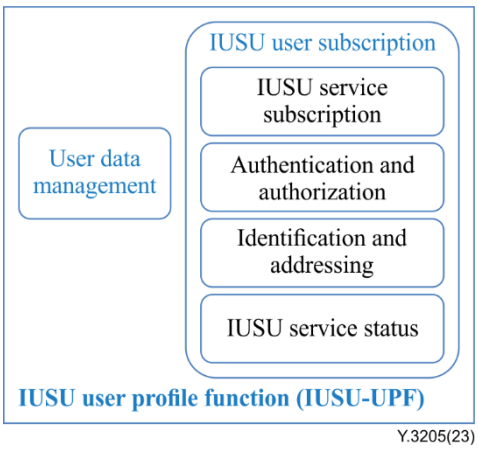

Figure 9-4 – Capability framework of IUSU-UPF

9.4 Capability framework of IUSU

The IUSU consists of the management and orchestration function, converged control plane capabilities, user plane capabilities and optional applications. The detail capabilities of IUSU are illustrated in Figure 9-5.

The management and orchestration function provides the capabilities of downloading, capability management and service orchestration of IUSU.

The converged control plane and user plane capabilities include the selected capabilities downloaded from NSCD in accordance with the user's requirements such as service and/or access requirements.

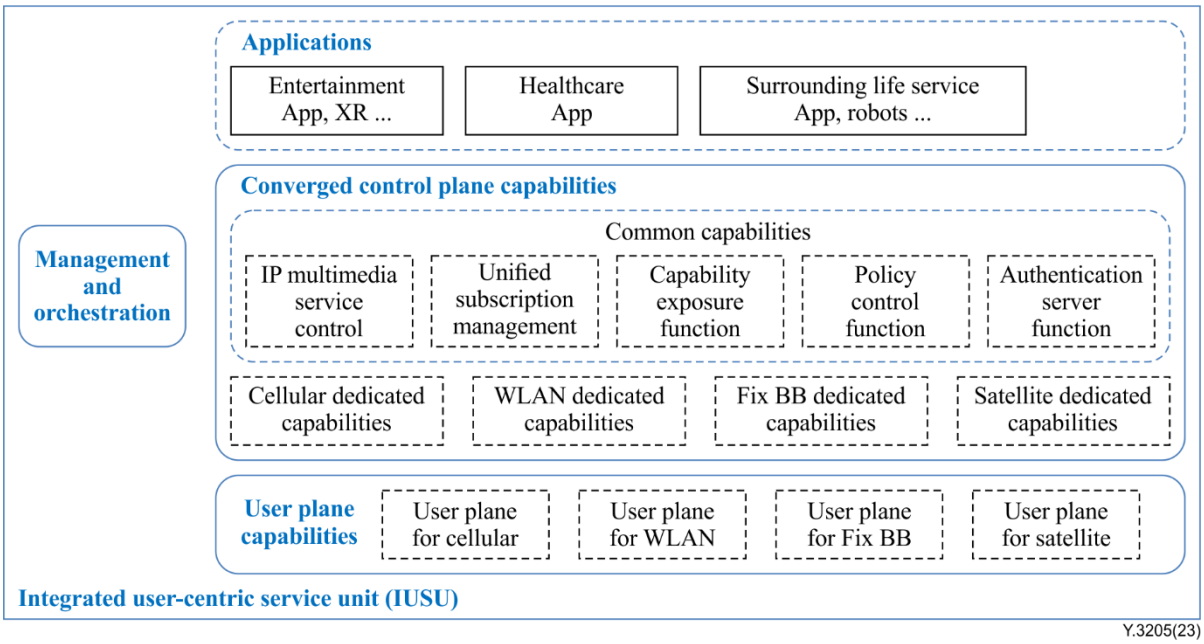

Figure 9-5 – Capability framework of IUSU

10 Security considerations

The security and privacy considerations of the IUSU-enabled converged network for FMSC in IMT-2020 networks and beyond include the following aspects.

- Control plane security, which includes the security considerations on NSCD, IUSU-UPF and IUSU, which support end users to define network and service capability profiles according to their own necessities.

- User plane security, which includes the security considerations on UPF contained in IUSU in support of mobile access, fixed access and satellite access.
- Management plane security, which includes the security considerations on the converged management of NSCD and IUSU-UPF and consideration on converged management and orchestration functions of network capability, service and application, user and resource in IUSU.
- User privacy, which includes the privacy considerations on IUSU which could store, cache and process user data related to privacy.

In addition, the security and privacy considerations of IUSU-enabled converged network for FMSC should be aligned with the requirements specified in [ITU-T Y.3200], [ITU-T Y.3101] and [b-ITU-T Y.2701].

Appendix I

Typical scenarios of IUSU for FMSC in IMT-2020 networks and beyond

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

I.1 General introduction

Figure I.1 illustrates the connectivity of devices and services used in typical scenarios such as smart home/health care, high precision manufacturing and AR/VR/MR.

IMT-2020 networks and beyond support multiple access technologies used by various devices. The devices used in cities and towns access IMT-2020 networks and beyond via PON, Wi-Fi, and terrestrial networks. The devices used in oceans, forest and deserts access the core network via satellite. The devices used in travelling nodes and rural areas may use PON, Wi-Fi, terrestrial networks and satellite.

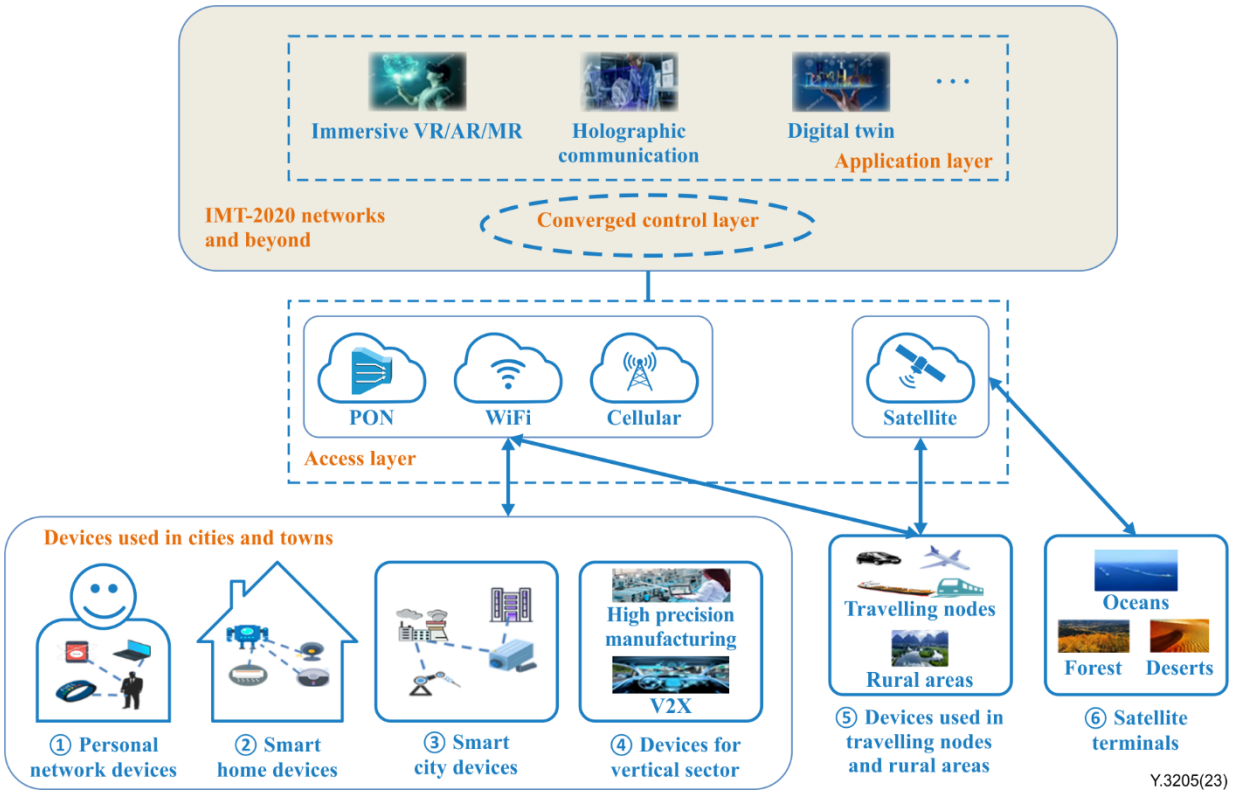

Figure I.1 – Connectivity of devices and services in typical use scenarios

I.2 Scenarios of autonomous service provisioning of IUSU

In this scenario, the user creates an IUSU which provides selected network functions, service capabilities and applications to the user's devices, such as mobile phone, pads and health care equipment.

I.2.1 Scenario of setting up a new IUSU

In this scenario, the user sets up an IUSU autonomously through interaction with the IUSU CRM system and the IUSU-UPF residing in the converged control layer of the network in IMT-2020 networks and beyond. The process of setting up a new IUSU is illustrated in Figure I.2.

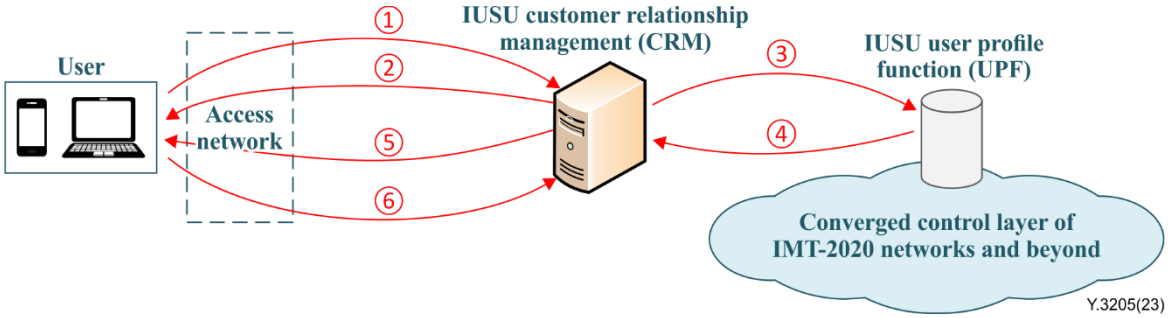

Figure I.2 – Scenario of IUSU set up

1. A user initiates a set up request.
2. The IUSU CRM verifies the user's identity and accepts the request after the verification is successful.
3. The IUSU CRM forwards the IUSU set up request to IUSU-UPF. The user's identity and a newly assigned IUSU identity are included in the set-up request.
4. The IUSU-UPF replies to the IUSU CRM with the IUSU's authentication information for access and service acquisition.
5. The IUSU CRM replies to the IUSU with initial profile notification including the IUSU identity and authentication information.
6. The user sends a set-up acknowledgement to IUSU CRM.

I.2.2 Scenario of cancelling an existing IUSU

In this scenario, the user cancels an IUSU autonomously through interaction with the IUSU CRM and the IUSU-UPF residing in the converged control layer of the network in IMT-2020 networks and beyond. The process of cancelling an existing IUSU is illustrated in Figure I.3.

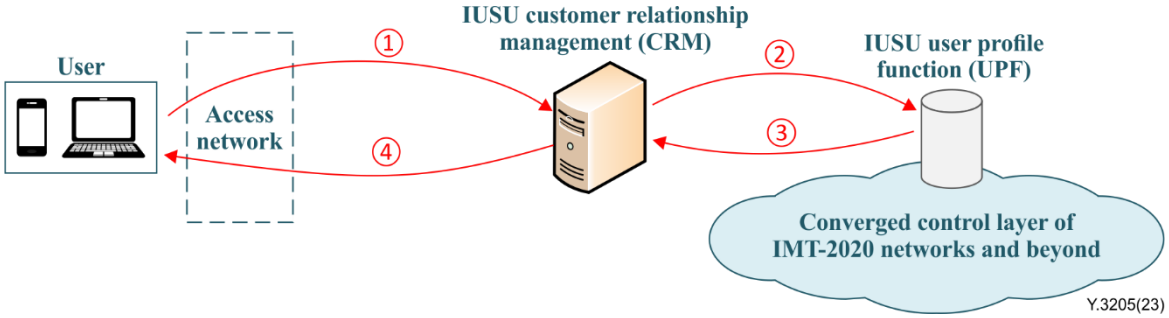

Figure I.3 – Scenario of IUSU cancellation

1. A user initiates an IUSU cancellation request.
2. IUSU CRM verifies the user's identity and forwards the IUSU cancellation request to IUSU-UPF.
3. The IUSU-UPF remove the user profile of the corresponding IUSU and replies to the IUSU CRM.
4. IUSU CRM replies to the user to acknowledge the cancellation of the IUSU.

I.2.3 Scenario of service orchestration in a new IUSU

In this scenario, the user orchestrates the network functions and service capabilities of an IUSU autonomously in support of the network and service functions depository (NSFD) and IUSU-UPF residing in the converged control layer of network in IMT-2020 networks and beyond. The process of service orchestration in a new IUSU is illustrated in Figure I.4.

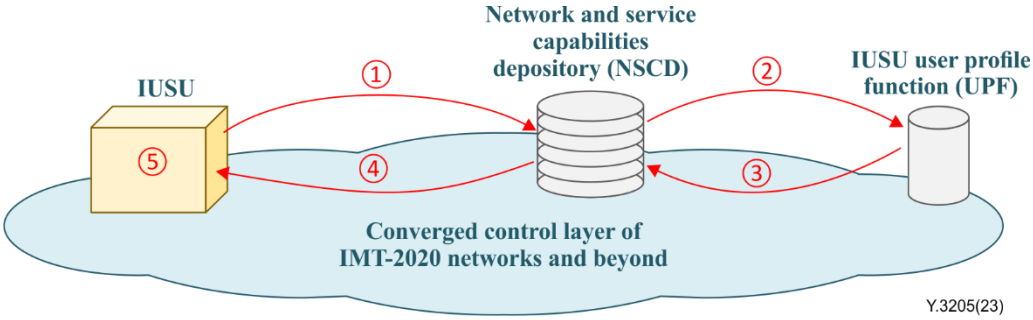

Figure I.4 – Scenario of IUSU orchestration

1. The IUSU sends network and service capabilities downloading request to the NSFD.
2. The NSFD sends an authentication request of the corresponding IUSU to IUSU-UPF.
3. The IUSU-UPF verifies the IUSU and replies to the NSFD with the result of the verification.
4. If the verification is successful, the NSFD replies to the IUSU providing the access of the corresponding capabilities, then IUSU starts downloading selected network and service capabilities.
5. Orchestration module of IUSU conducts orchestration of downloaded capabilities.

I.2.4 Scenario of application acquisition for an IUSU

In this scenario, the user obtains required applications from the application depository, which stores applications from the Internet, operator's networks or uploaded by users. The process of application acquisition for an IUSU is illustrated in Figure I.5.

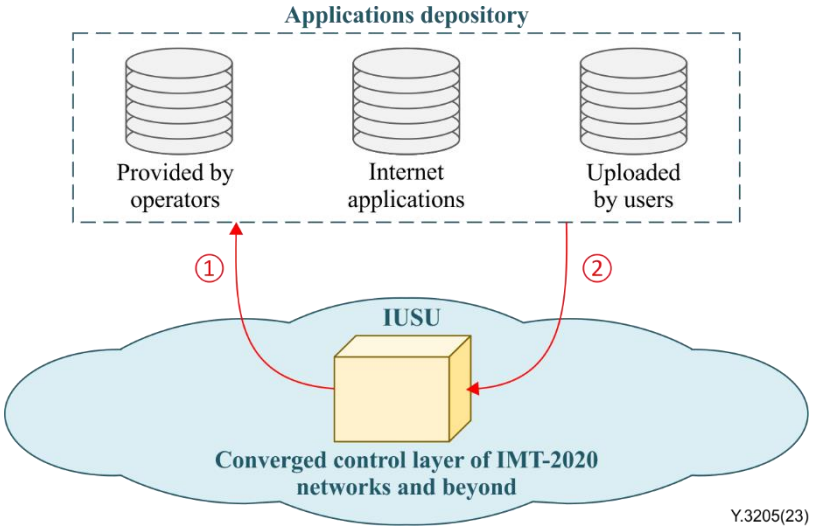

Figure I.5 – Scenario of IUSU application acquisition

1. IUSU sends application downloading request to the application depository.
2. The application depository provides the access of selected applications for the IUSU to download. The IUSU downloads the selected applications.

I.3 Scenario of IUSU initialization and registration

In this scenario, the user has finished the orchestration of the selected application, network functions and capabilities of the IUSU and is ready to initialize and register the IUSU to the network in IMT-2020 networks and beyond. The process of IUSU initialization and registration is illustrated in Figure I.6.

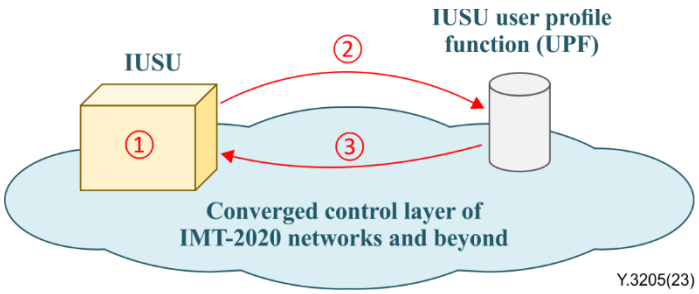

Figure I.6 – Scenario of IUSU initialization and registration

1. The IUSU starts initialization.
2. The IUSU sends a registration request to the IUSU-UPF.
3. The IUSU-UPF authenticates the IUSU and replies to the IUSU when the authentication is successful. The status of the corresponding IUSU is changed to registered in the IUSU-UPF.

I.4 Scenario of UE registering to an IUSU

In this scenario, a device could register to a designated IUSU for required services. The IUSU could support the authenticated mechanisms for security and privacy purposes. The process of device registers to an IUSU is illustrated in Figure I.7.

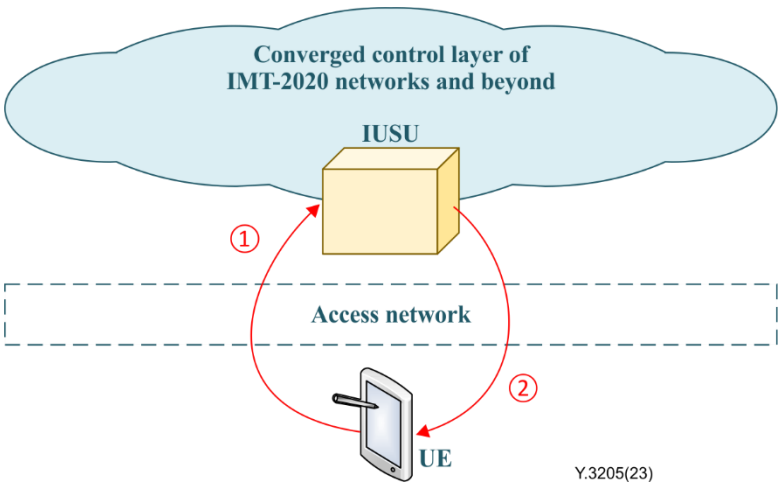

Figure I.7 – Scenario of UE registering to an IUSU

1. A UE sends a registration request to the IUSU.
2. IUSU authenticates the UE and replies to the UE when the authentication is successful. The registration information, such as the IP address of the corresponding UE, is stored in the IUSU. The UE is available and ready to use the IUSU applications after a successful registration.

I.5 Scenario of service routing within an IUSU

In this scenario, a UE would like to establish a service connection to another UE within the same IUSU and communicate with each other. The process of service routing within an IUSU is illustrated in Figure I.8.

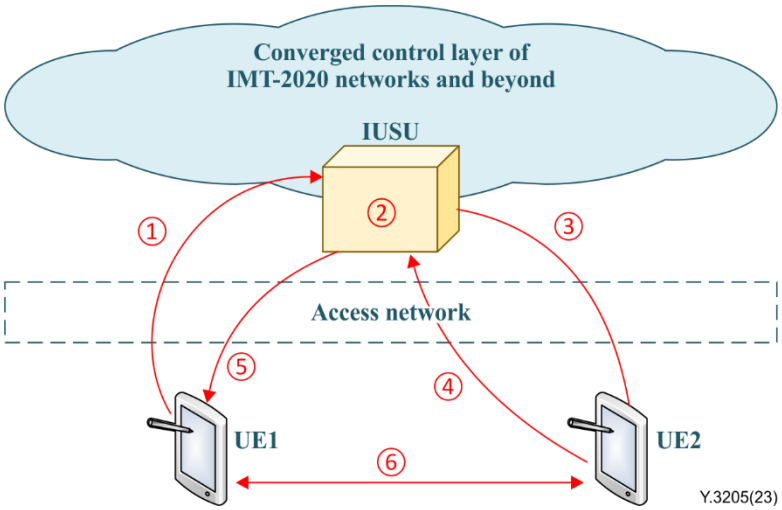

Figure I.8 – Scenario of service routing within IUSU

1. UE1 initiates a connection establishment request to UE2.
2. The corresponding IUSU conducts a service and destination analysis.
3. IUSU forwards the connection establishment request to UE2.
4. UE2 is available and sends the connection establishment response to IUSU.
5. IUSU forwards the connection establishment response to UE1.
6. The service connection is established between UE1 and UE2.

I.6 Scenarios in support of multiple access technologies

In these scenarios, the IUSUs are required to support the access control functions on demand to satisfy the requirements of users of different access technologies. The relevant scenarios are identified below.

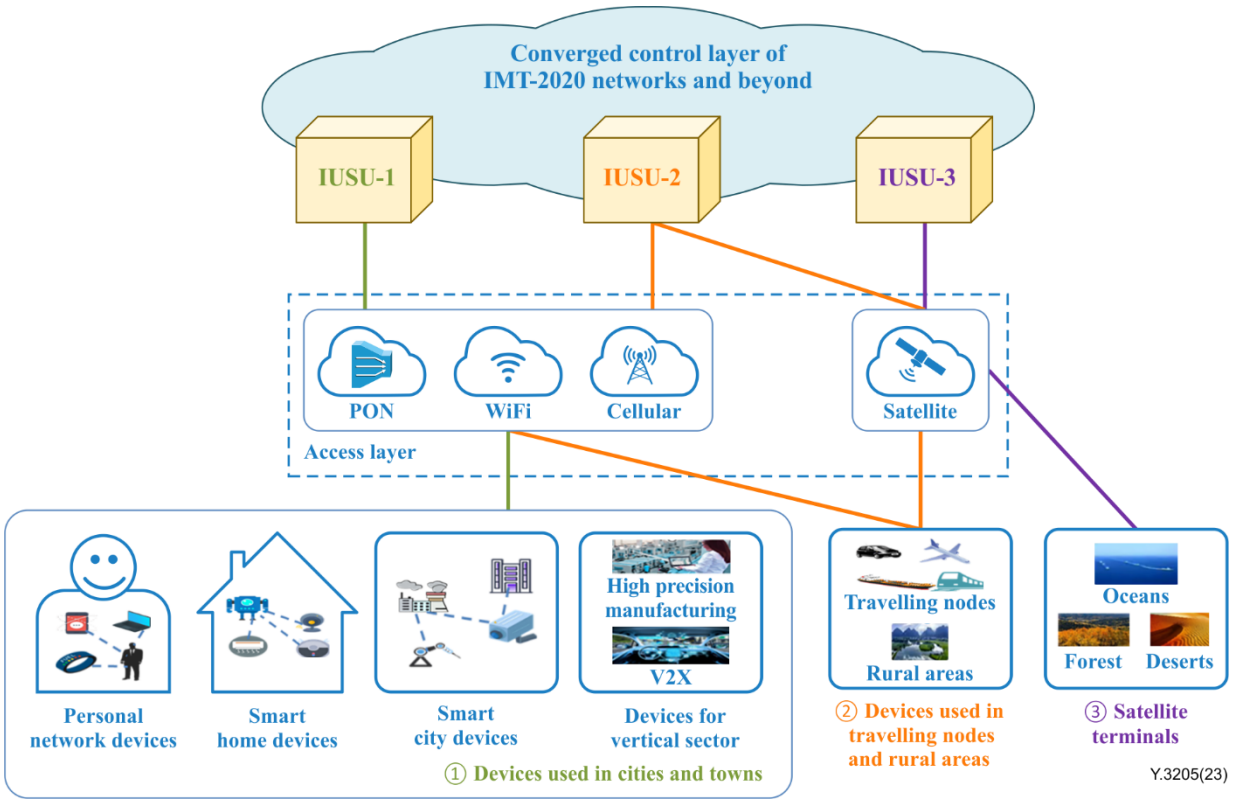

Figure I.9 – Scenarios in support of multiple access technologies

Scenario 1: For the devices used in cities and towns, which may access IMT-2020 networks and beyond via PON, Wi-Fi, and terrestrial networks, the IUSU-1 is required to support the land-based access control functions on demand.

Scenario 2: For the devices used in travelling nodes and rural areas, which may access IMT-2020 networks and beyond via PON, Wi-Fi, terrestrial networks and satellite, the IUSU-2 is required to support the integrating land-based access and satellite access control functions on demand.

Scenario 3: For the devices used in oceans, forest and deserts, which may access the core network via satellite, the IUSU-3 is required to support the satellite access control functions.

I.7 Scenarios in support of real time service

In this scenario, IUSUs are required to support the end–end connection of real time service. The process of real time service connection is illustrated in Figure I.10.

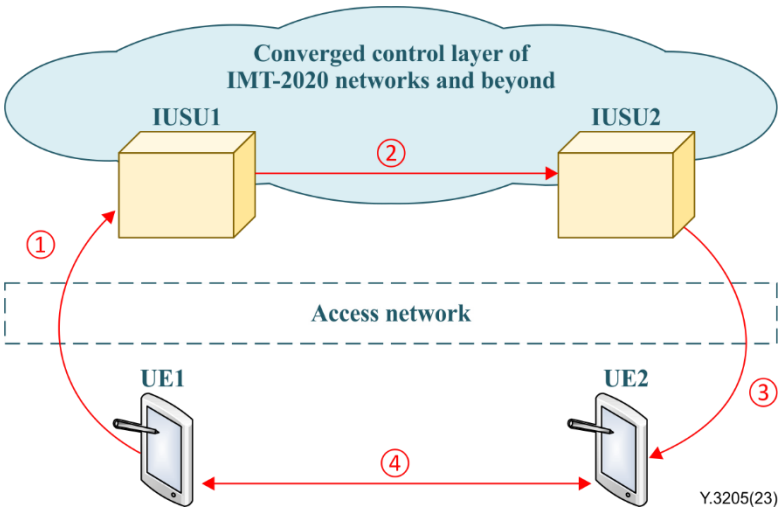

Figure I.10 – Scenario of real time service connection

1. The originating UE registers to an originating IUSU. It sends a service connection request to the originating IUSU with the ITU-T E.164 number of the terminating UE.
2. The originating IUSU finds the route to the terminating IUSU that the terminating UE registered to and sends service connection request to it with the terminating number.
3. The terminating IUSU forwards the request to the terminating UE based on the UE's IP address.
4. The service connection is established between UE1 and UE2.

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