

Recommendation

ITU-T Y.3206 (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 –
Capability exposure for IMT-2020 networks and
beyond**

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Recommendation ITU-T Y.3206

Fixed, mobile and satellite convergence – Capability exposure for IMT-2020 networks and beyond

Summary

Capability exposure provides functionalities for network functions to expose their capabilities to third parties (e.g., users or other operators). Fixed, mobile and satellite convergence (FMSC) is the capability that provides services and applications to end users regardless of the fixed, mobile or satellite access technologies. Recommendation ITU-T Y.3206 specifies the scenarios, requirements, reference points, network function enhancements, procedures and security considerations of capability exposure for FMSC, in the context of IMT-2020 networks and beyond.

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Recommendation ITU-T Y.3206

Fixed, mobile and satellite convergence – Capability exposure for IMT-2020 networks and beyond

1 Scope

This Recommendation specifies the capability exposure for fixed, mobile and satellite convergence (FMSC) in IMT-2020 networks and beyond. Capability exposure provides functionalities for network functions to expose their capabilities to third parties (e.g., users or other operators). FMSC is the capability that provides services and applications to end users regardless of the fixed, mobile or satellite access technologies.

This Recommendation specifies the following aspects of capability exposure for FMSC in IMT-2020 networks and beyond:

- Scenarios of capability exposure;
- Requirements of capability exposure;
- Reference points of capability exposure;
- Network function enhancements of capability exposure;
- Procedures of capability exposure;
- Security considerations.

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 (2018), *Framework of the IMT-2020 network*.
- [ITU-T Y.3104] Recommendation ITU-T Y.3104 (2018), *Architecture of the IMT-2020 network*.
- [ITU-T Y.3105] Recommendation ITU-T Y.3105 (2018), *Requirements of capability exposure in the IMT-2020 network*.
- [ITU-T Y.3108] Recommendation ITU-T Y.3108 (2019), *Capability exposure function in IMT-2020 networks*.
- [ITU-T Y.3133] Recommendation ITU-T Y.3133 (2019), *Capability exposure enhancement for supporting fixed mobile convergence in IMT-2020 networks*.
- [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 control plane [b-ITU-T Y.2011]: The set of functions that controls the operation of entities in the stratum or layer under consideration, plus the functions required to support this control.

3.1.2 data plane [b-ITU-T Y.2011]: The set of functions used to transfer data in the stratum or layer under consideration.

3.1.3 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.

3.1.4 fixed mobile convergence [b-ITU-T Y.3100]: In the context of IMT-2020, the capabilities that provide services and applications to end users regardless of the fixed or mobile access technologies being used and independently of the users' location.

3.1.5 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].

3.1.6 machine learning (ML) [b-ITU-T Y.3172]: Processes that enable computational systems to understand data and gain knowledge from it without necessarily being explicitly programmed.

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

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

3.1.9 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.

3.1.10 user plane [b-ITU-T Y.2011]: A synonym for data plane.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AF	Application Function
AI	Artificial Intelligence
CEF	Capability Exposure Function
FMC	Fixed Mobile Convergence
FMSC	Fixed, Mobile and Satellite Convergence
FQDN	Fully Qualified Domain Name
GNSS	Global Navigation Satellite System
HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
MEC	Multi-access Edge Computing

ML	Machine Learning
PDU	Protocol Data Unit
QoS	Quality of Service
RP	Reference Point
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
URL	Uniform Resource Locator

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.

6 Scenarios of capability exposure for fixed, mobile and satellite convergence

6.1 Overview

Capability exposure provides functionalities for network functions to expose their capabilities to third parties (e.g., users or other operators). FMSC is the capability that provides services and applications to end users regardless of the fixed, mobile or satellite access technologies. To enable the satellite use cases and key elements for integration of satellite systems specified in [b-ITU-R M.2460-0], it is feasible to introduce capability exposure in FMSC networks. In FMSC networks, the land-based or satellite-based core network connects to the fixed access network, mobile access network, and satellite access network; and it provides the IMT-2020 core network functionalities and FMSC functionalities. The capability exposure for FMSC involves both IMT-2020 capabilities and FMSC capabilities. Figure 6-1 presents an overview of scenarios of capability exposure for fixed, mobile and satellite convergence in IMT-2020 networks and beyond.

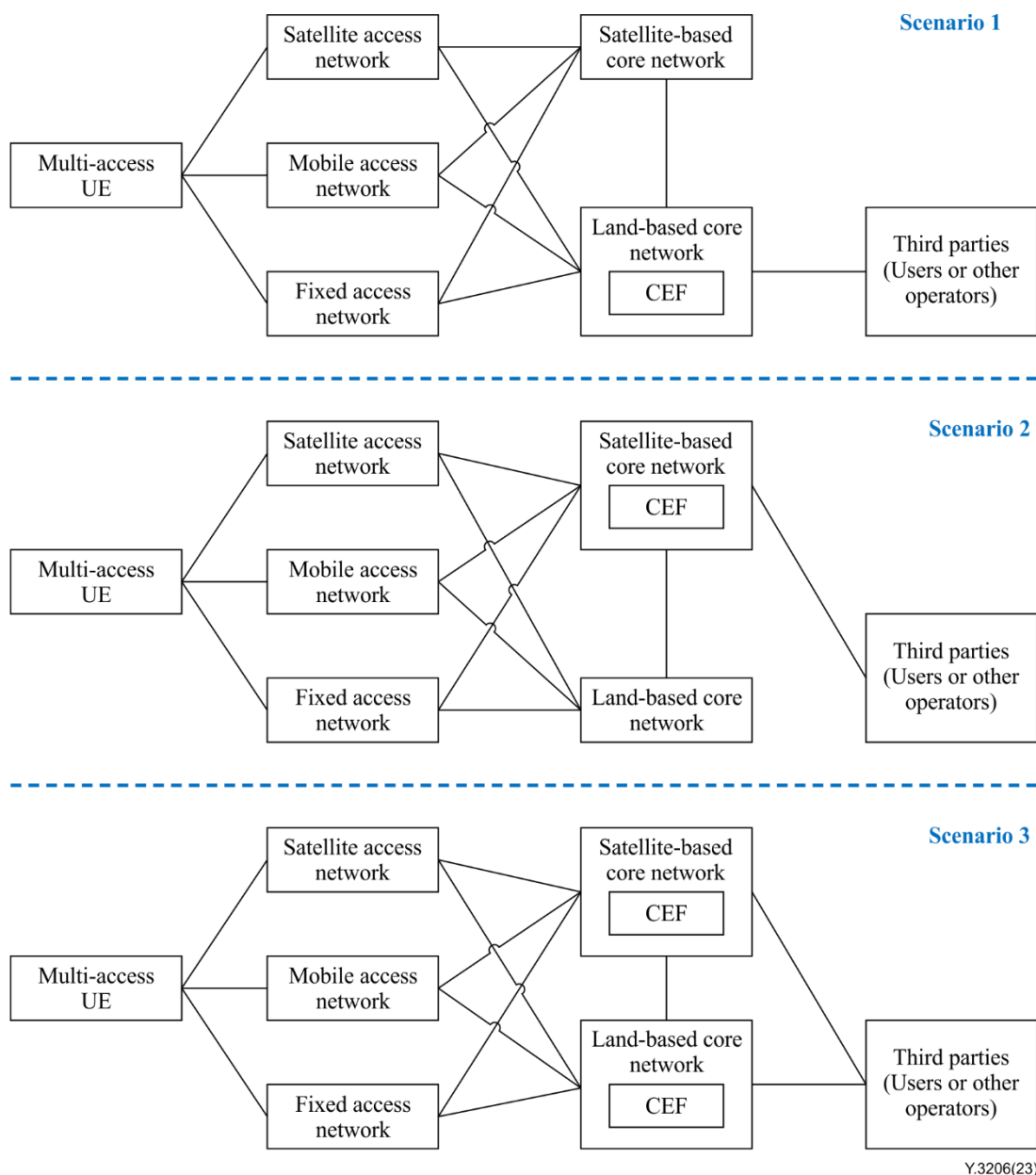


Figure 6-1 – Overview of scenarios of capability exposure for fixed, mobile and satellite convergence

The scenarios shown in Figure 6-1 are as follows:

- Scenario 1: capabilities converged in land-based core networks. In this scenario, the Capability Exposure Function (CEF) is located at the land-based core network. The network functions of satellite-based core network registers and exposes the capabilities of a satellite-based network to the CEF of a land-based core network, and the CEF of the land-based core network exposes the capabilities of the land-based network and satellite-based network to third parties. The third parties can be users or other operators.
- Scenario 2: capabilities converged in a satellite-based core network. In this scenario, the CEF is located at the satellite-based core network. The network functions of the land-based core network registers and exposes the capabilities of the land-based network to the CEF of the satellite-based core network, and the CEF of the satellite-based core network exposes the capabilities of the land-based network and satellite-based network to third parties. The third parties can be users or other operators.

- Scenario 3: capabilities distributed in land-based and satellite-based core networks. In this scenario, CEFs are located at both the land-based core network and the satellite-based core network. The CEF of the land-based core network exposes the capabilities of the land-based network and satellite-based network to third parties; and the CEF of the satellite-based core network exposes the capabilities of the land-based network and satellite-based network to third parties. The third parties can be users or other operators.

In Scenario 1 and Scenario 2, the fixed access network, mobile access network, satellite access network, land-based core network and satellite-based core network belong to the same operator. While in Scenario 3, the fixed access network, mobile access network, satellite access network, land-based core network and satellite-based core network may belong to the same operator, or may belong to different operators.

6.2 Scenario of capabilities converged in land-based core networks

In this scenario, the CEF of the land-based core network is responsible for capability exposure in the FMSC network. The CEF of the land-based core network registers, manages and exposes the capabilities of the land-based network and satellite-based network. A full set of capability exposure functions and interfaces are adopted by the CEF of the land-based core network.

6.3 Scenario of capabilities converged in satellite-based core networks

In this scenario, the CEF of the satellite-based core network is responsible for capability exposure in the FMSC network. The CEF of the satellite-based core network registers, manages and exposes the capabilities of the land-based network and satellite-based network. A lightweight set of capability exposure functions and interfaces are adopted by the CEF of satellite-based core network.

6.4 Scenario of capabilities distributed in land-based and satellite-based core networks

In this scenario, the CEF of the land-based core network and the CEF of the satellite-based core network are responsible for capability exposure in the FMSC network. The CEF of the land-based core network registers and manages the capabilities of the land-based network; the CEF of the satellite-based core network registers and manages the capabilities of the satellite-based network; both the CEF of the land-based core network and the CEF of the satellite-based core network expose the capabilities of the land-based and satellite-based networks. A full set of capability exposure functions and interfaces are adopted by the CEF of the land-based core network, while a lightweight set of capability exposure functions and interfaces are adopted by the CEF of the satellite-based core network. The between-network capability exposure interfaces are used by the CEF of the land-based core network and the CEF of the satellite-based core network, for invoking the registered capabilities of each other.

7 Requirements of capability exposure for fixed, mobile and satellite convergence

7.1 Capability requirements

The FMSC network is required to support a unified capability exposure for fixed access, mobile access and satellite access. The exposed capabilities include common capabilities of the IMT-2020 network and specific capabilities of the FMSC network. The capability requirements for capability exposure in the FMSC network are as follows:

- It is required to register, manage and expose the control plane capabilities, including the capabilities of mobility management, session management, connection management, subscription management, authentication and authorization, and policy control [ITU-T Y.3102] [ITU-T Y.3104] [ITU-T Y.3200].
- It is required to register, manage and expose the user plane capabilities, including the capabilities of traffic routing and forwarding, traffic filtering, traffic offload, protocol data

unit (PDU) session tunnel management, quality of service (QoS) enforcement, service identification and fully qualified domain name (FQDN) / uniform resource locator (URL) resolution [ITU-T Y.3102] [ITU-T Y.3104] [ITU-T Y.3200].

- It is required to register, manage and expose the service continuity capabilities [b-ITU-T Y.3204].
- It is required to register, manage and expose the end-to-end QoS capabilities [b-ITU-T Y.3107].
- It is required to register, manage and expose the network slicing capabilities, including those specified in [ITU-T Y.3105].
- It is required to register, manage and expose the multi-access edge computing (MEC) capabilities, including those specified in [ITU-T Y.3105].
- It is required to register, manage and expose the network management and orchestration capabilities, including those specified in [ITU-T Y.3108].
- It is required to register, manage and expose the network data analytics' capabilities, including those specified in [ITU-T Y.3105].
- It is required to register, manage and expose the multi-access convergence capabilities, including fixed mobile convergence (FMC) capabilities, as specified in [ITU-T Y.3133], and FMSC capabilities as specified in [ITU-T Y.3201].

7.2 CEF requirements

The CEF provides functionalities for network functions and network slices to expose their capabilities as a service to third parties [ITU-T Y.3102] [ITU-T Y.3104]. The CEF requirements for capability exposure in the FMSC network are as follows:

- The CEF is required to support the requirements of capability exposure as specified in [ITU-T Y.3105].
- The CEF is required to support the capability exposure functionalities including collection, translation, exposure, and authorization and validation, as specified in [ITU-T Y.3108].
- The CEF is required to support the framework and procedures of capability exposure as specified in [ITU-T Y.3108].
- The CEF is required to support the registry, management and exposure of the capabilities specified in this Recommendation, including the specific capabilities of the FMSC network.
- The CEF is required to support the registry, management and exposure of the capabilities of both the land-based network and satellite-based network.
- The CEF is required to support the registry, management and exposure of the capabilities of the access network, core network and service platform.
- The CEF is required to attach the condition of connection for the capabilities of satellite-based networks. The condition of connection is the availability of connections at specific spaces and at specific times.
- The CEF is required to support the deployment for scenarios of capability exposure specified in this Recommendation.
- The CEF is required to use a lightweight set of capability exposure functions and interfaces when deployed at the satellite-based core network.
- The CEF is required to support the between-network capability exposure interfaces for invoking the registered capabilities of the other CEF, in the scenario of capabilities distributed in land-based and satellite-based core networks.
- The CEF is required to support the customization of capability exposure functionalities based on the requirements of operators.

- The CEF is recommended to utilize the satellite ephemeris to facilitate the determination of the time and methods for capability exposure, when deployed at the satellite-based core network.
- The CEF is recommended to utilize the service information of a third party to facilitate the determination of the time and methods for capability exposure, when deployed at the satellite-based core network.
- The CEF is recommended to enable the use of artificial intelligence (AI) / machine learning (ML) functionalities as specified in [b-ITU-T Y.3172].

8 Reference points of capability exposure for fixed, mobile and satellite convergence

8.1 Reference points of capabilities converged in land-based core networks

In an FMSC network, the capability exposure reference points (RPs) of capabilities converged in land-based core networks are as follows:

- RP-el: the reference point between the CEF of land-based core network and third party's application function (AF). A full set of capability exposure interfaces are used in this reference point.
- RP-ec: the reference point between the CEF and core network functions. The condition of connection is attached for the interfaces related to the satellite-based core network in this reference point.
- RP-ea: the reference point between the CEF and fixed/mobile/satellite access networks. The condition of connection is attached for the interfaces related to the satellite access network in this reference point.

The above reference points are expected to adopt the protocol stack based on hypertext transfer protocol (HTTP) [b-IETF RFC 7540] / transmission control protocol (TCP) / Internet protocol (IP) for control-related interfaces; and the protocol stack based on HTTP / user datagram protocol (UDP) / IP for user-related interfaces and data transmission-related interfaces.

8.2 Reference points of capabilities converged in satellite-based core network

In the FMSC network, the capability exposure reference points of capabilities converged in satellite-based core networks are as follows:

- RP-es: the reference point between the CEF of the satellite-based core network and a third party's AF. A lightweight set of capability exposure interfaces are used in this reference point.
- RP-ec: the reference point between the CEF and core network functions. The condition of connection is attached for the interfaces related to satellite-based core network in this reference point.
- RP-ea: the reference point between the CEF and fixed/mobile/satellite access networks. The condition of connection is attached for the interfaces related to satellite access networks in this reference point.

The above reference points are expected to adopt the protocol stack based on HTTP [b-IETF RFC 7540] / TCP / IP for control-related interfaces; and the protocol stack based on HTTP / UDP / IP for user-related interfaces and data transmission-related interfaces.

8.3 Reference points of capabilities distributed in land-based and satellite-based core networks

In the FMSC network, the capability exposure reference points of capabilities distributed in land-based and satellite-based core networks are as follows:

- RP-el: the reference point between the CEF of a land-based core network and a third party's AF. A full set of capability exposure interfaces are used in this reference point.
- RP-es: the reference point between the CEF of a satellite-based core network and a third party's AF. A lightweight set of capability exposure interfaces are used in this reference point.
- RP-ee: the reference point between the CEF of a land-based core network and the CEF of a satellite-based core network. The between-network capability exposure interfaces are used in this reference point.
- RP-ec: the reference point between the CEF and core network functions. The condition of connection is attached for the interfaces related to satellite-based core networks in this reference point.
- RP-ea: the reference point between the CEF and fixed/mobile/satellite access networks. The condition of connection is attached for the interfaces related to satellite access networks in this reference point.

The above reference points are expected to adopt the protocol stack based on HTTP [b-IETF RFC 7540] / TCP / IP for control-related interfaces; and the protocol stack based on HTTP / UDP / IP for user-related interfaces and data transmission-related interfaces.

9 Network function enhancements of capability exposure for fixed, mobile and satellite convergence

9.1 General descriptions

To support the scenarios of capability exposure for FMSC, the CEF can be deployed at the land-based core network (namely land-based CEF) or at the satellite-based core network (namely satellite-based CEF). The land-based CEF adopts a full set of capability exposure functions and interfaces, while the satellite-based CEF adopts a lightweight set of capability exposure functions and interfaces. Despite the deployment, both the land-based CEF and satellite-based CEF support the exposure of the capabilities of the land-based network and satellite-based network. The basic functions of the CEF are specified in [ITU-T Y.3105] and [ITU-T Y.3108].

9.2 Enhancements to land-based CEF

The enhancements to the land-based CEF in IMT-2020 networks and beyond are as follows:

- The land-based CEF is enhanced to support the specific capabilities of the FMSC network and FMC network.
- The land-based CEF is enhanced to support the registry, management and exposure of the capabilities of both land-based networks and satellite-based networks.
- The land-based CEF is enhanced to support attaching the condition of connection for the capabilities of satellite-based networks, in which the condition of connection is the availability of connection for the network capability at a specific geographical space (longitude interval and latitude interval) and at a specific time period (from t1 to t2).
- The land-based CEF is enhanced to support the between-network capability exposure interfaces for invoking the registered capabilities of the satellite-based CEF.

9.3 Enhancements to satellite-based CEF

The enhancements to the satellite-based CEF in IMT-2020 networks and beyond are as follows:

- The satellite-based CEF is enhanced to support the specific capabilities of the FMSC network and FMC network.
- The satellite-based CEF is enhanced to support the registry, management and exposure of the capabilities of both land-based networks and satellite-based networks.

- The satellite-based CEF is enhanced to support attaching the condition of connection for the capabilities of satellite-based networks, in which the condition of connection is the availability of connection for the network capability at a specific geographical space (longitude interval and latitude interval) and at a specific time period (from t1 to t2).
- The satellite-based CEF is enhanced to support using a lightweight set of capability exposure functions and interfaces.
- The satellite-based CEF is enhanced to support the between-network capability exposure interfaces for invoking the registered capabilities of the land-based CEF.
- The satellite-based CEF is enhanced to support utilizing the satellite ephemeris to facilitate the determination of the time and methods for capability exposure.
- The satellite-based CEF is enhanced to support utilizing the service information of a third party to facilitate the determination of the time and methods for capability exposure.

10 Procedures of capability exposure for fixed, mobile and satellite convergence

10.1 General procedures of capability exposure

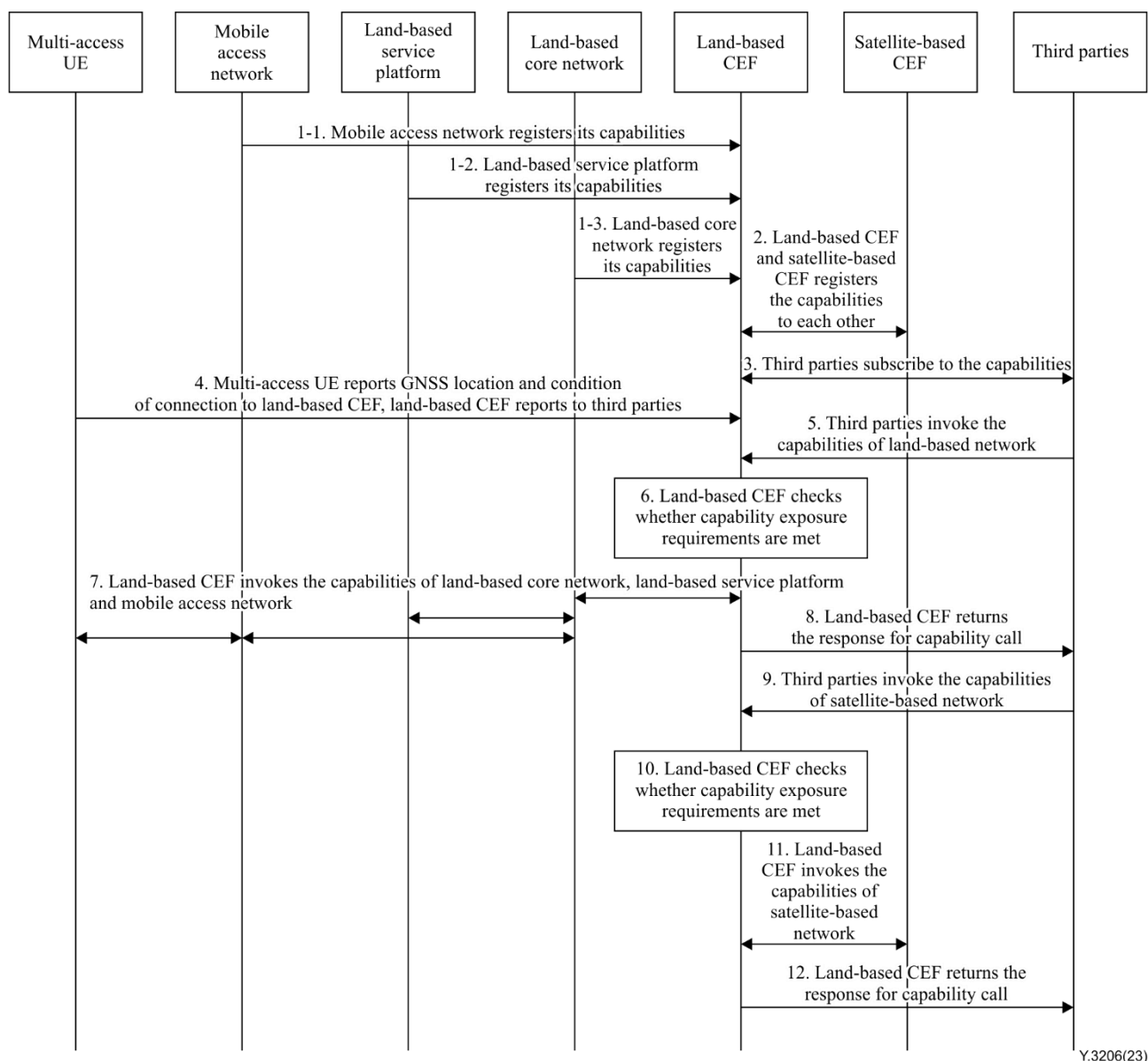
The general procedures of capability exposure for IMT-2020 networks are as follows, which are specified in [ITU-T Y.3108]:

- The procedure of authentication and authorization of third parties;
- The procedure of subscription and notification of network event monitoring;
- The procedure of provisioning of configuration parameters.

In an FMSC network, the above general procedures of capability exposure are reused, except that in the scenario of capabilities distributed in land-based and satellite-based core networks there are two types of CEF. These include the land-based CEF and the satellite-based CEF and the information related to authentication, authorization, subscription, notification and provisioning is exchanged between the land-based CEF and satellite-based CEF.

10.2 Procedure of capability exposure through land-based CEF

Figure 10-1 depicts the procedure of capability exposure through a land-based CEF in the scenario of capabilities distributed in land-based and satellite-based core networks.



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Figure 10-1 – Procedure of capability exposure through land-based CEF

The steps shown in Figure 10-1 are as follows:

- 1) The mobile access network, land-based service platform and land-based core network register their capabilities at the land-based CEF.
- 2) The land-based CEF registers the capabilities of the land-based network to the satellite-based CEF; the satellite-based CEF registers the capabilities of the satellite-based network to the land-based CEF.
- 3) The land-based CEF published the capabilities to third parties; the third parties subscribe to the capabilities.
- 4) The multi-access UE reports its global navigation satellite system (GNSS) location and condition of connection to the land-based CEF; the land-based CEF reports the GNSS location and condition of connection of the multi-access UE to third parties.
- 5) Third parties invoke the capabilities of the land-based network, taking into account the GNSS location and condition of connection of the multi-access UE.
- 6) The land-based CEF checks whether the capability exposure requirements are met, taking into account the GNSS location and condition of connection of the multi-access UE.

- 7) The land-based CEF invokes the capabilities of the land-based core network, land-based service platform and mobile access network.
- 8) The land-based CEF returns the response for a capability call to third parties.
- 9) Third parties invoke the capabilities of the satellite-based network, taking into account the conditions of connection for capabilities, as well as the GNSS location and condition of connection of the multi-access UE.
- 10) The land-based CEF checks whether the capability exposure requirements are met, taking into account the conditions of connection for capabilities, as well as the GNSS location and condition of connection of the multi-access UE.
- 11) The land-based CEF invokes the capabilities of satellite-based network at the satellite-based CEF.
- 12) The land-based CEF returns the response for a capability call to third parties.

10.3 Procedure of capability exposure through satellite-based CEF

Figure 10-2 depicts the procedure of capability exposure through a satellite-based CEF in the scenario of capabilities distributed in land-based and satellite-based core networks.

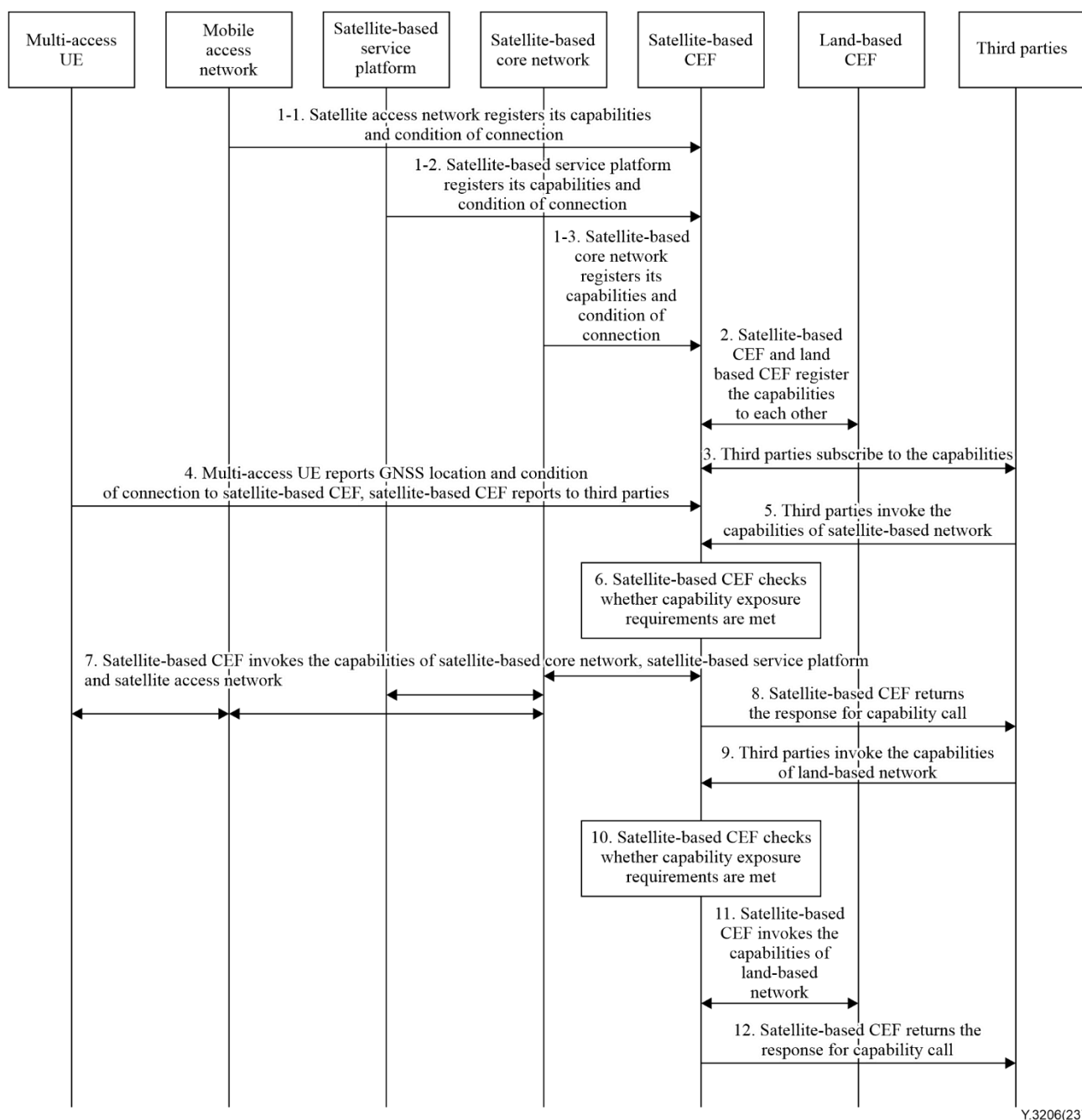


Figure 10-2 – Procedure of capability exposure through satellite-based CEF

The steps shown in Figure 10-2 are as follows:

- 1) The satellite access network, satellite-based service platform and satellite-based core network register their capabilities and corresponding conditions of connection at the satellite-based CEF.
- 2) The satellite-based CEF registers the capabilities of the satellite-based network to the land-based CEF; the land-based CEF registers the capabilities of the land-based network to the satellite-based CEF.
- 3) The satellite-based CEF published the capabilities and corresponding conditions of connection to third parties; the third parties subscribe to the capabilities.
- 4) The multi-access UE reports its GNSS location and condition of connection to the satellite-based CEF; the satellite-based CEF reports the GNSS location and condition of connection of the multi-access UE to third parties.

- 5) Third parties invoke the capabilities of the satellite-based network, taking into account the conditions of connection for capabilities, as well as the GNSS location and condition of connection of the multi-access UE.
- 6) The satellite-based CEF checks whether the capability exposure requirements are met, taking into account the conditions of connection for capabilities, as well as the GNSS location and condition of connection of the multi-access UE.
- 7) The satellite-based CEF invokes the capabilities of the satellite-based core network, satellite-based service platform and satellite access network.
- 8) The satellite-based CEF returns the response for a capability call to third parties.
- 9) Third parties invoke the capabilities of the land-based network, taking into account the GNSS location and condition of connection of the multi-access UE.
- 10) The satellite-based CEF checks whether the capability exposure requirements are met, taking into account the GNSS location and condition of connection of the multi-access UE.
- 11) The satellite-based CEF invokes the capabilities of the land-based network at the land-based CEF.
- 12) The satellite-based CEF returns the response for a capability call to third parties.

11 Security considerations

The security and privacy considerations on capability exposure for FMSC in IMT-2020 networks and beyond include the following aspects:

- capability security, which includes the security considerations on the common capabilities of the IMT-2020 network and specific capabilities of an FMSC network;
- CEF security, which includes the security considerations on the land-based CEF, satellite-based CEF and reference points of capability exposure;
- third party security, which includes the security considerations on the use of capability exposure interfaces by third parties and the management of third parties in the CEF.
- user privacy, which includes the privacy considerations on CEF, which is a central point that collects, stores, caches and processes user data related to privacy.

In addition, the security and privacy considerations on capability exposure for FMSC should be aligned with the requirements specified in [ITU-T Y.3200], [b-ITU-T Y.3101] and [b-ITU-T Y.2701].

Bibliography

- [b-ITU-T Y.2011] Recommendation ITU-T Y.2011 (2004), *General principles and general reference model for Next Generation Networks*.
- [b-ITU-T Y.2701] Recommendation ITU-T Y.2701 (2007), *Security requirements for NGN release 1*.
- [b-ITU-T Y.3100] Recommendation ITU-T Y.3100 (2017), *Terms and definitions for IMT-2020 network*.
- [b-ITU-T Y.3101] Recommendation ITU-T Y.3101 (2018), *Requirements of the IMT-2020 network*.
- [b-ITU-T Y.3107] Recommendation ITU-T Y.3107 (2019), *Functional architecture for QoS assurance management in the IMT-2020 network*.
- [b-ITU-T Y.3172] Recommendation ITU-T Y.3172 (2019), *Architectural framework for machine learning in future networks including IMT-2020*.
- [b-ITU-T Y.3204] Recommendation ITU-T Y.3204 (2023), *Fixed, mobile and satellite convergence – Service continuity for IMT-2020 networks and beyond*.
- [b-ITU-R M.1645] Recommendation ITU-R M.1645 (2003), *Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000*.
- [b-ITU-R M.2460-0] Recommendation ITU-R M.2460-0 (2019), *Key elements for integration of satellite systems into Next Generation Access Technologies*.
- [b-IETF RFC 7540] IETF RFC 7540 (2020), *Hypertext Transfer Protocol Version 2 (HTTP/2)*.

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