

Recommendation

ITU-T Y.3217 (04/2025)

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

Future networks

Fixed, mobile and satellite convergence – Peer-to-peer services for IMT-2020 networks and beyond

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Recommendation ITU-T Y.3217

Fixed, mobile and satellite convergence – Peer-to-peer services for IMT-2020 networks and beyond

Summary

Peer-to-peer (P2P) networks can provide several benefits in fixed mobile satellite convergence (FMSC) network for providing IMT-2020 networks and beyond services including distributed data processing and content caching. FMSC is the capability that provides services and applications to end users regardless of the fixed, mobile or satellite access technologies being used. Recommendation ITU-T Y.3217 specifies the peer-to-peer services in FMSC network for IMT-2020 networks and beyond, focusing on general consideration, requirements, functional architecture, workflow and security considerations.

History*

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Content sharing, FMSC, IMT-2020, peer-to-peer services.

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Recommendation ITU-T Y.3217

Fixed, mobile and satellite convergence – Peer-to-peer services for IMT-2020 networks and beyond

1 Scope

This Recommendation specifies the peer-to-peer services (P2P) in fixed, mobile and satellite convergence (FMSC) for IMT-2020 networks and beyond, and addresses the following aspects:

- General consideration on P2P in FMSC network;
- General framework of P2P services;
- Requirements of P2P services for FMSC network;
- Functional architecture for the mobility support of P2P in FMSC network;
- Information workflows;
- Security considerations.

Different scenarios for P2P services in FMSC networks 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 Y.2815](#)] Recommendation ITU-T Y.2815 (2018), *Mobility-supporting architecture for mobile peer-to-peer services in heterogeneous wireless networks*.
- [[ITU-T Y.3101](#)] Recommendation ITU-T Y.3101 (2018), *Requirements of the IMT-2020 network*.
- [[ITU-T Y.3130](#)] Recommendation ITU-T Y.3130 (2018), *Requirements of IMT-2020 fixed mobile convergence*.
- [[ITU-T Y.3134](#)] Recommendation ITU-T Y.3134 (2020), *IMT-2020 fixed mobile convergence functional requirements for management and orchestration*.
- [[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 (FMSC) [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].

NOTE – [b-ITU-R M.1645] defines the framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000 for the radio access network.

3.1.3 multi-access user equipment (MUE) [b-ITU-T Y.3218]: A user equipment which can support accessing two or more access networks simultaneously under the control of a network enhanced for multi-access capability.

3.1.4 peer [b-ITU-T X.1161]: Communication node on P2P network that functions simultaneously as both "client" and "server" to the other nodes on the network.

3.1.5 peer-to-peer (P2P) [b-ITU-T Y.2206]: A system is considered to be P2P if the nodes of the system share their resources in order to provide the service the system supports. The nodes in the system both provide services to other nodes and request services from other nodes.

NOTE – Peer is the node in a P2P system

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AMMC	Access Mobility Management Controller
ANMF	Access Network traffic Monitoring Function
BTS	Base Transceiver Station
CDP	Content Downloading Peer
CSF	Content Storage Function
CUP	Content Uploading Peer
D2D	Device to Device communication
DMF	Device status Monitoring Function
eMBB	Enhanced Mobile Broadband
FMSC	Fixed Mobile Satellite Convergence
ISN	Intermediate Super Node
MIPF	Meta-Information Processing Function
mMTC	Massive Machine-Type Communications
MUE	Multi-access User Equipment
NR	New Radio
P2P	Peer-to-Peer
QoS	Quality of Service
SPF	Super Peer Function
UE	User Equipment
URLLC	Ultra Reliable Low Latency Communications
VR	Virtual Reality

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 Overview on P2P in FMSC network

In recent years, fixed mobile satellite convergence (FMSC) has been expanding in IMT-2020 networks and beyond [ITU-T Y.3201] [ITU-T Y.3200], which can integrate various access networks with various bandwidth, transmission costs, and quality of service (QoS) parameters, as well as physical specifications and coverage as a converged network. Fixed, mobile and satellite convergence in IMT-2020 networks and beyond can support new generation services including ultra reliable low latency communications (URLLC), enhanced mobile broadband (eMBB) and massive machine-type communications (mMTC). Meanwhile, peer-to-peer (P2P) services [ITU-T Y.2815] in fixed, mobile and satellite convergence in IMT-2020 networks and beyond provide a good opportunity to use the capabilities of these networks. Device to device (D2D) communication is one of the important technologies in this regard that can be used for various applications and scenarios such as disasters, traffic offloading and industrial automation. For example, consider the flash traffic scenario in which thousands of users in a small area, perhaps attending a football game, suddenly become interested in the same content (e.g., a replay clip). They can use the P2P service and so the contents are shared between users through D2D links as one of the commercial applications and especially for draining data traffic.

Moreover, peer-to-peer (P2P) networks can provide several benefits in FMSC network for providing IMT-2020 networks and beyond services [b-ITU-T Y.3106], including, but not limited to:

- Distributed data processing: in FMSC network that supports IMT-2020 networks and beyond services, large volumes of data, such as video, images, and sensor data are provided which must be processed and analysed in real-time. P2P services can be used to distribute this processing load across multiple devices, reducing the burden on individual devices and improving overall performance and response times.
- Content caching: There are different access networks that should be controlled by FMSC network and enable high-speed data transfer, but the latency associated with retrieving data from a remote server or from a high-latency access network can still be a bottleneck. P2P networks in FMSC network can be used to cache content on nearby devices/select proper access, reducing the amount of data that needs to be transferred over the network and improving response times.
- Cost savings: P2P services in FMSC architecture can be cost-effective specially when it supports IMT-2020 services with specific QoS requirements and heterogeneous access networks, as they require less server infrastructure and can leverage existing devices connected to different access networks.
- Convergence aspects: By leveraging P2P mechanisms, distributed resources across different network domains are used so that this aspect enables efficient data processing and content caching in FMSC in IMT-2020 networks and beyond.