Standardization Trends in Real-time Communications at 3GPP

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Abstract

Studies and specification work are proceeding at the 3rd Generation Partnership Project (3GPP) on functional enhancements to the IP (Internet protocol) Multimedia Subsystem (IMS), which is an international standard specifying IP telephone networks provided by telecommunication operators, and on support for real-time communications not limited to IMS functional enhancements. This article provides an overview of IMS functional enhancements in Release 17, the specification work of which was completed in June 2022, and introduces studies and specification work for real-time communications in Release 18 now in progress.

Keywords: 3GPP, real-time communications, IMS

1. PSTN to IP network migration/IP interconnection among telecommunication operators in Japan, and 3GPP IMS

In Japan, the migration of the public switched telephone network (PSTN) to Internet protocol (IP) networks and IP interconnection among telecommunication operators are moving forward with completion scheduled for January 2025. Interface specifications (such as TTC JJ-90.30) for inter-operator IP interconnection of telephone services in Japan are based on the inter-IP Multimedia Subsystem (IMS) network-to-network interface specification (TS 29.165) specified at the 3rd Generation Partnership Project (3GPP) [1]. 3GPP IMS is being widely applied in overseas IP telephone networks, the same as in Japan, and studies and specification work are currently underway on using the 5th-generation mobile communication system (5G) and making functional enhancements to services on the basis of the requirements and proposals of international standardization organizations such as the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T), regional standardization organizations such as the Alliance for Telecommunications Industry Solutions (ATIS) in the United States and European Telecommunications Standards Institute (ETSI) in Europe, industry organizations such as the GSM Association (GSMA), and participating companies.

2. IMS standardization trends in 3GPP

3GPP uses a mechanism called “Release” for studies and specification work to enable equipment vendors and telecommunication operators to implement and use a stable platform at some point in time. The most recent set of 3GPP specifications ready for implementation in September 2022 are Release 17 specifications completed in June 2022. Studies and specification work are currently underway on Release 18 with completion scheduled for March 2024.

Looking at studies and specification work on 3GPP IMS specifications since Release 15 when the specification work for 5G began, two types of work have been conducted that can be broadly divided into functional enhancements related to linking IMS with 5G and functional enhancements of multimedia services provided by IMS.

Functional enhancements related to linking IMS with 5G were conducted in stages so that the existing IMS network can use 5G. Specifically, Release 15 supported the Diameter protocol, which is used at the interface between a 4G core network (EPC: evolved packet core) and IMS network, at the interface

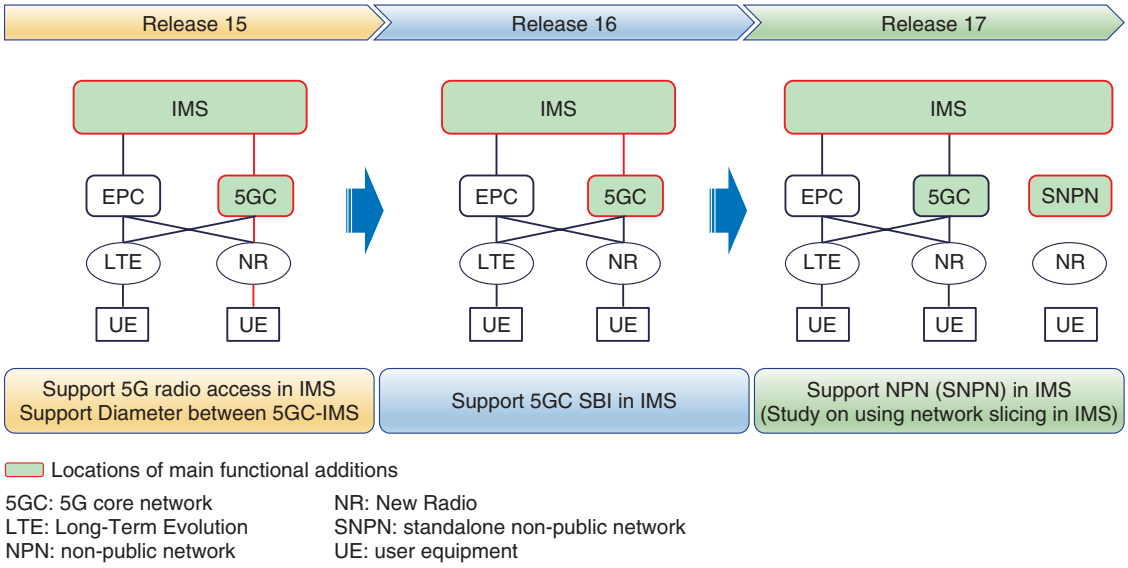

Fig. 1. Progress of studies and specification work linking 5G and IMS.

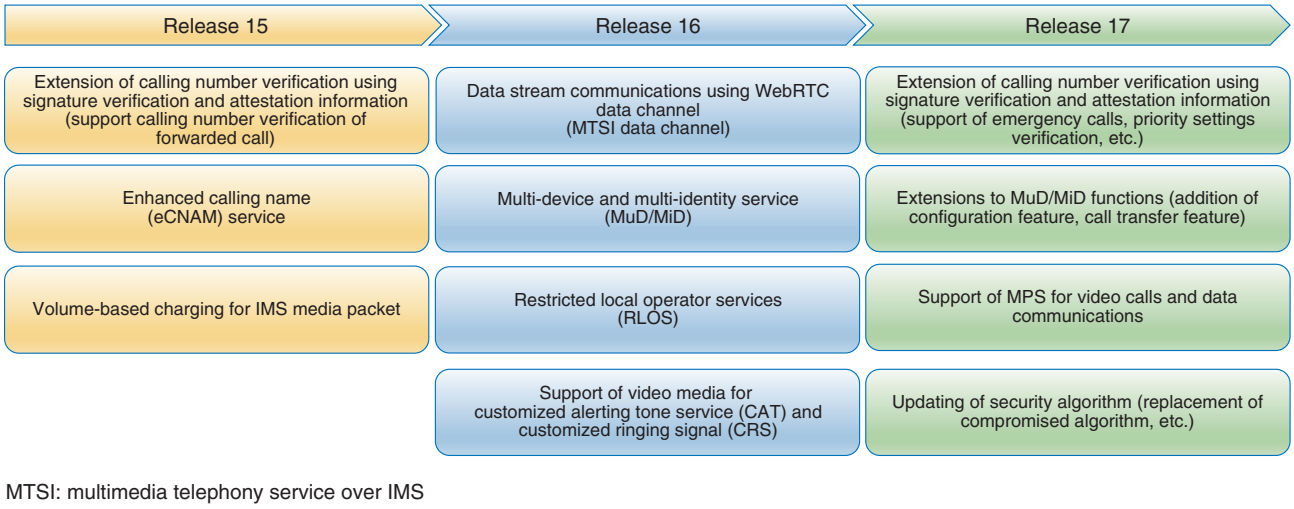

Fig. 2. Functional enhancements and service extensions in IMS.

between a 5G core network and IMS network to support connections between this 5G core network and the existing IMS network; Release 16 supported the HTTP (Hypertext Transfer Protocol)-based service based interface (SBI) protocol, which is applied in a 5G core network, for connections between that network and an IMS network to enable IMS to use 5G core network functions; and Release 17 studied functional enhancements to enable IMS to use specific functions newly introduced in 5G (**Fig. 1**).

Regarding the functional enhancements of IMS and service extension, studies and specification work were conducted on specification extensions to the calling number verification using signature verification and attestation information and on support for additional IMS supplementary services, multimedia priority service (MPS), data channels, etc. (**Fig. 2**). In Release 18, the IMS data channel supported in Release 16 is now being studied for the use of transmitting/receiving immersive video data to support

Key issues under study	Proposals for solving issue under study
#1 Enhancement to support data-channel usage in IMS network	• IMS architecture extension (definition of connection interface to data-channel function and interaction method) • Specification of method for discovering IMS data channel support/no-support by terminal/network
#2 IMS-based AR telephony communication	• Application of IMS data channel architecture to AR communications (transmitting/receiving of audio/video by RTP and AR media by data channel) • Support of terminal-rendering and network-rendering methods (coordinating with SA4 WG)
#3 Third-party-specific user IDs	• Extension of user authentication/permission function (use of OAuth2.0, extension of IMS HSS registration function, etc.) • Functional extension of originating ID verification function using signature information (support third-party ID use case)
#4 Study of applicability of service-based principles to IMS media control interfaces	• Support SBI by IMS U-plane entity • Application of 5G SBA network repository function (NRF) in IMS MRF discovery/selection

HSS: home subscriber server
MRF: media resource function
SBA: service-based architecture
U-plane: user plane

Fig. 3. Study of IMS functional enhancements in SA2.

new communication services providing augmented reality (AR), virtual reality (VR), and mixed reality (MR) in IMS.

3. Functional enhancements related to IMS in Release 17

Release 17 was completed in June 2022. Focusing on functional enhancements related to IMS and 5G, specification work for functional enhancements of non-public network (NPN) in 5G included NPN support in IMS and a preliminary study on the use of 5G functions through IMS. As the name indicates, NPN enables deployment of 5G for private network use. NPN specification defines two key NPN deployment options: a public network integrated non-public network (PNI-NPN) that uses a 5G network provided by a telecommunication operator as an NPN and a standalone non-public network (SNPN) that uses a 5G network created by a user (e.g., company) on its own independent of any 5G network provided by a telecommunication operator. Specification work on NPN support in IMS supported IMS emergency calls and voice calls. In addition, the preliminary study on the use of 5G functions through IMS limited the target of study to the use of network slicing, and a policy of extending data network name (IMS DNN) information registered in unified data management (UDM: subscriber data management/processing function) was adopted to support a scenario that selects a different network slice for each IMS network. The specification work to support the conclusion of this study is expected in Release 18.

4. Study of specifications for real-time communications in Release 18

Studies and specification work toward functional enhancements of communication services are also being conducted in Release 18, and among these services, lively discussions are being held on specifications to support user communication in virtual space such as the *metaverse* and immersive (based on AR, VR, etc.) real-time communications (RTC) with the aim of achieving more immersive communications with a high sense of presence.

3GPP Service and System Aspects Working Group 2 (SA2)[*1] is studying specification extensions to a 5G core network and additional functional enhancements to IMS to support high-performance media communications including AR/VR/MR. Further functional enhancements to IMS includes studies on supporting AR telephone communications (**Fig. 3**). This IMS functional enhancement is targeting extensions to data-channel use cases to be supported by IMS, support of AR telephone communications, support of third-party user identities (IDs), and application of

*1 3GPP SA2: Group studying specifications for architecture and services.

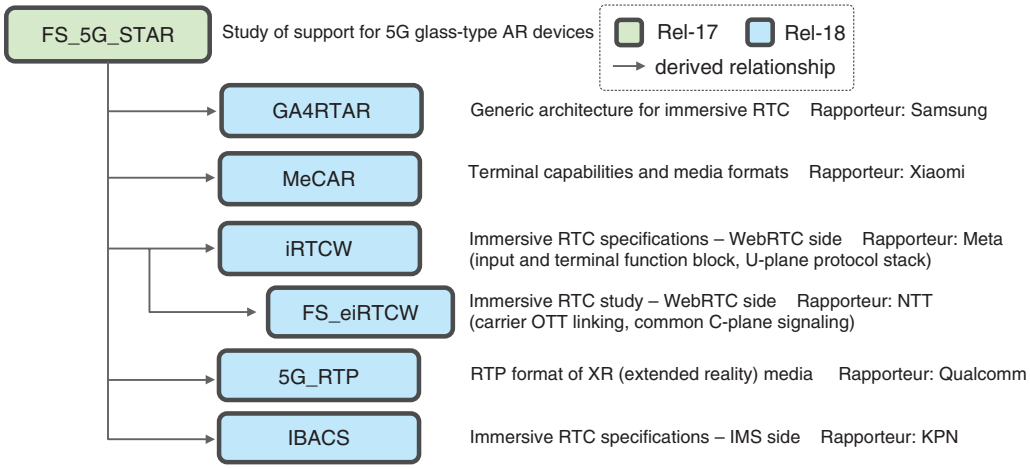

Fig. 4. RTC-related studies and specification work in SA4.

SBI to IMS media control interfaces. The support of AR telephone communications includes parallel studies on a method for transmitting/receiving audio/video media via the Real-time Transport Protocol (RTP) as before and transmitting/receiving AR media/data via the data channel by using architecture extensions to the data channel in IMS.

3GPP SA4[*2], meanwhile, is studying a method for IMS functional enhancements and a method for using WebRTC in conjunction with studies on achieving immersive RTC.

IMS has prescribed a signaling system with high interconnectivity as specifications for IP telephone services provided by telecommunication operators and has continued to make functional enhancements. However, while guaranteeing high interconnectivity, these built-in specifications have heightened the barrier to third parties participating in services; as a result, the market launch of new services has been lagging. Under these conditions, Release 18 includes a proposal for a method using WebRTC in addition to a method for IMS functional enhancements with respect to establishing immersive RTC media sessions. IMS functional enhancements are progressing in Work Item IBACS (IMS-based AR Conversational Services), and a new method using WebRTC is mainly being studied in Work Item iRTCW (Immersive Real-time Communication for WebRTC) (**Fig. 4**).

In iRTCW, the terminal architecture for achieving immersive RTC and specifications for essential input/output parameters, a mechanism for establishing media sessions and one for requesting the 5G system to execute quality of service (QoS) control are being studied on the basis of a policy of using functions specified in existing 5GMS (TS 26.501) media-streaming/architecture specifications. Given that external service providers such as over-the-top (OTT) service providers are the agents of service provision, this is an attempt to adopt a simple means of establishing a media path by removing interconnectivity between services provided by individual service providers from the scope of their operations.

While immersive RTC as a carrier service will lower the barrier to participation and enable rapid rollout of services on the market, studies will be needed from the viewpoint of interconnectivity between telecommunication operators and between service providers, the same as telephone communication service in PSTN and IMS. WebRTC specified by the Internet Engineering Task Force (IETF) and the World Wide Web Consortium (W3C) assumes the use of a client application provided by a specific service provider under a model in which the installation of the same client application secures closed connectivity within the service. To secure interconnectivity between services without limiting it to specific service providers, there will be a need for common specifications in signaling with regard to establishing sessions that have so far been service dependent.

NTT considers the study of common signaling specifications necessary for bolstering interconnectivity in immersive RTC using WebRTC to be introduced in the future. NTT has therefore been proposing contributions since 2021 at the time of preliminary

*2 3GPP SA4: Group studying specifications for codecs and media.

studies on AR communications for Release 17 and has been holding discussions on that need. Thus, it was approved to study a common signaling method as Preliminary Study Item FS_eiRTCW for implementing functional enhancements to the iRTCW method mentioned above in Release 18. In FS_eiRTCW, an extensible signaling method is being studied that can be achieved by applying as many current 3GPP specifications and those of other standardization organizations such as IETF and W3C as possible while guaranteeing interconnectivity. It is also expected that this common signaling method will enable new use cases to be flexibly supported and enhance cloud affinity by using web-based technology all while satisfying the main requirements for establishing a session (signaling server's discovery procedure and registration process, client authentication, QoS negotiation, etc.).

5. Future prospects

IMS has been at the core of IP telephone services provided by telecommunication operators, and it is expected that IMS will continue to provide robust communication services and functional enhancements as a lifeline provided by telecommunication operators. Studies have also begun on a new method for achieving immersive RTC services including the metaverse using WebRTC. As a telecommunication operator, NTT plans to keep a close watch on these standardization trends in real-time communications while making proposals on improving user experience and interconnectivity and contributing to studies and specification work toward the provision of attractive services.

Reference

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