3GPP SA1 | Service Requirements | Release 11

Standardization

3GPP SA1 Release 11 Standardization Trends

At the 3GPP, which standardizes mobile communications networks technologies, a study on service requirements for functions provided in 3GPP Release 11 was completed in August 2011. This article provides an overview of new functions in SA1 Release 11 such as network optimization for machine-type communications and non-voice emergency services.

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1. Introduction

The Technical Specification Group Services and System Aspects Working Group 1 (3GPP TSG SA1) is a standards group that studies service requirements for mobile communications network technologies. Many telecommunications operators and network-equipment, User-equipment (UE), and Universal Subscriber Identity Module (USIM)*1 vendors from around the world participate, 3GPP SA1 has the responsibility of studying service requirements that mobile communications operators are looking to provide in the future.

At 3GPP SA1, studies on service requirements for Release 11 functions commenced in May 2010 and specifications were frozen in August 2011.

In this article, we provide an overview of representative items from among the various service requirements specified as Release 11 functions and describe use cases for them. We also introduce study items for Release 12 as discussed at the August 2011 meeting.

2. SA1 Release 11 Standardization Trends

For Release 11, 3GPP SA1 studied new service requirements such as a network optimization function to provide low-cost services via Machine-Type Communications (MTC) and non-voice emergency communications (for police, fire department, etc.). It also studied user identifiers for MTC devices*2 and portability of identifiers used in the IP Multimedia Subsystem (IMS)*3 [2] that provides voice services in LTE [1].

3GPP SA1 also studied new issues facing telecommunications operators such as network issues caused by new mobile applications accessed from smartphones.

2.1 Study on Network Optimization for MTC

Network optimization for MTC (System Improvements for Machine-type Communications [3]) has been studied since Release 10 as a major item of concern among many participating companies. Release 10 provided the requirements for identification of MTC devices and handsets and basic functions in relation to the issue of network congestion*4 caused by MTC devices.

In Release 11, SA1 focused on reducing the costs of MTC devices and their communication costs, and studied

*1 **USIM**: A smart card recording information such as the telephone number contracted with a mobile phone company.

*2 **MTC device**: A device for small-module communications without human interaction.

network optimization functions for MTC-device communications and mobility characteristics. Some of the requirements related to network optimization for MTC devices are shown in **Table 1**.

To give some examples, MTC devices typically used in gas meters and vending machines can be characterized by little or no mobility, the transmission of small amounts of data related to sales, measurements, etc., and call-origination only, that is, no use cases of call termination. Consequently, to reduce the cost of MTC devices and MTC communications in comparison with handsets, optimization studies were carried out on reducing the frequency and the number of signals for mobility control[*5] in the network and on allocating network resources to MTC devices only when needed.

There are other network-optimization functions not listed in Table 1. However, it has been decided to prioritize the following items: assignment of addresses and identifiers to MTC devices, functions for MTC devices limited to packet communications, and network triggering of MTC devices.

2.2 Study on Alternative to Existing Telephone Numbers for MTC Devices

As described in Section 2.1, a huge number of MTC devices are expected to be connected to the network in the future. In fact, it is predicted that the number of MTC devices worldwide will reach tens of billions of units.

The use of telephone numbers as identifiers for communication terminals is specified by ITU-T Recommendation E.164[*6]. These telephone numbers provide a maximum of 15 digits including a country code and an operator-identifying number [4]. However, ITU-T has recognized that assigning telephone numbers to tens of billions of MTC devices will exhaust all 15 digits in some countries and regions.

Telephone numbers, moreover, have traditionally been allocated to handsets for the purpose of making voice calls and using SMS. In contrast, most communication by MTC devices is packet-based with few occasions for making voice calls. The question has been raised as to whether allocating telephone numbers to MTC devices is really necessary.

Table 1 Study items for network optimization in MTC

Function	Description
MTC device triggering	Transmit a trigger from the MTC server to control MTC-device communications
Small data transmissions	Reduce control signals and number of network connections for MTC devices that transmit only small amounts of data
Low mobility	Change and simplify the frequency of mobility control for MTC devices
Time controlled	Enable MTC-device communications only at a specific time and disable otherwise
Mobile originated only	Reduce frequency of mobility control for MTC devices that only originate calls
Infrequent transmission	Allocate resources only at the time of communication for MTC devices that transmit infrequently and immediately terminate those resources once communication terminates
MTC monitoring	Monitor for change in settings and location, mismatch between UICC and MTC device, etc.
Priority alarm	Prioritize notification of theft, vandalism, etc.
Location specific trigger	Provide a location-specific trigger for MTC devices having low mobility
Time tolerant	Give low priority to MTC-device communications not restricted to a certain transmission time
MTC group	Group certain MTC devices together to optimize control

UICC：Universal Integrated Circuit Card

*3 **IMS**: A communications method that achieves multimedia services by integrating circuit-switched services through Internet technologies such as SIP.

*4 **Congestion**: A state in which communication requests concentrate in a short period and exceed the capability of network equipment.

*5 **Mobility control**: A control technology that enables the continuous provision of outgoing/incoming calls and communications even if a terminal's contact point with the core network changes due to wireless switching.

*6 **E.164**: An ITU-T recommendation for number planning in the telephone network.

To resolve this issue, 3GPP SA1 has begun to study the assignment of a new type of identifier different from telephone numbers to MTC devices (Alternative to E.164 for Machine-Type Communications [5]).

At present, though, mobile communications operators are still providing MTC services based on E.164. For this reason, NTT DOCOMO has proposed and reflected in SA1 specifications that operators should be able to use the existing E.164 method over the short term, that they should increase their number of digits within the maximum length defined by E.164 over the medium term, and that they should be able to select either a short-term or medium-term solution in accordance with policy or demand.

For the long term, the provision of MTC using a new type of identifier as an alternative to E.164 is now being studied, and the Session Initiation Protocol Uniform Resource Identifier (SIP URI)[*7] [6] has been proposed as a candidate.

In the United States, simulations have shown that increasing the number of digits in existing numbers within the 15-digit length of E.164 would be costly [5]. It should also be considered that the deployment of IMS will be progressing with the introduction of packet-based Voice over LTE (VoLTE) [7]. With the above in mind, SIP URI, which is also used by IMS, is coming to be seen as at least one long-term solution to the identifier issue.

In the future, SA1 will decide on what type of identifiers should be adopted as long-term 3GPP solution.

2.3 Non-voice Emergency Services

Communication between people by text messages as in e-mail and by Instant Message (IM)[*8] services has recently been expanding. As a consequence, Average monthly Revenue Per Unit (ARPU)[*9] between voice calls and packet communications reversed in mobile communications.

Contacting emergency authorities like the police and fire department, however, has so far been limited to voice calls in standard specifications. As a consequence, it has been difficult to convey detailed conditions of an emergency using images or video, or for physically disabled people to convey their location when they need to report an emergency. In fact, it is a requirement in Europe, the United States, and other countries to also provide non-voice means of emergency notification.

To address this issue, 3GPP SA1 has begun to study non-voice methods for contacting emergency authorities (NOVES: Non-Voice Emergency Services [8]).

A precondition in NOVES is that both the UE and answering point of the emergency authority need to support NOVES. The provision of diverse methods for contacting emergency authorities can therefore be envisioned, such as video phones, text messages and real-time chat in addition to voice calls. Furthermore, whether it be by voice calls or non-voice means, NOVES will enable users to send detailed information in the form of images, video, etc. to an emergency authority either during or after a call.

The implementation of NOVES is expected for a variety of reasons. With NOVES, people in dangerous situations like abduction will be able to contact emergency authorities even when voice calls are difficult to make, physically disabled people will find it easier to initiate such contact, and users will be able to provide the answering point of the emergency authority with detailed information at the time of an emergency.

2.4 SIP URI Portability

Number portability for mobile terminals has already been introduced not just in Japan but also in many countries and regions including the United States, Europe and Korea. For the LTE era, 3GPP is studying the provision of

*7 **SIP URI**: An SIP addressing scheme used when making a telephone call via SIP protocol.

*8 **IM**: A set of communication technologies used for real-time text-based direct communication between two or more participants.

*9 **ARPU**: As the average monthly revenue per subscriber contract, a useful index of operator profitability.

voice services by VoLTE. As mentioned above, VoLTE will, in general, make use of SIP URI. Since it is predicted that portability in LTE will be provided in the same manner as number portability, 3GPP SA1 has begun a study on requirements in relation to methods for providing SIP URI portability (IMS network independent public user identities [9]).

At present, telephone numbers used as user identifiers include information that identifies the operator to which the user is contracted to. With SIP URI, however, it is also possible to assign an ID that does not include such operator-identifying information. Thus, for mobile communications operators doing business in more than one country, it will be possible to assign a common domain name (e.g., name@operator.com) in different countries.

Likewise, it will be possible for an enterprise that spans several countries to assign their company name to the SIP URI domain (e.g., name@company.com). As a result, a user assigned to an overseas post will be able to receive services using the same SIP URI without having to contract for a new one with the local operator.

In the above way, the provision of SIP URI portability is expected to provide users with efficient portability in VoLTE.

2.5 Study on the Impact of Mobile Applications on the Network

The number of smartphone users has been increasing dramatically in Japan and other countries, and operators need mechanisms to avoid the network load caused by smartphone applications. At 3GPP SA1, activities to analyze and solve this issue have begun (MODAI: Mobile Data Applications Impact [10]). Based on the operational experience of these mobile communications operators, the following four issues have come to be recognized in MODAI.

1) Inefficiency of Communication Resources

Presence[*10] and IM are typical smartphone applications. Compared to past services, they are characterized by a small amount of data and frequent transmission. As a result, the size of the header is proportionally large compared to the data payload. A mechanism to optimize the header size to those services will therefore be required.

2) Reduced Battery Life of UE

Communications such as user status updates via IM and social networking applications frequently change between active/idle states. This increases the UE's battery consumption, which needs to be minimized.

3) Increase in the Number of Control Plane Signals

As described in 2), the UE frequently changes between active/idle states due to user status updates. The network will be required to support a congestion control mechanism caused by bursts of control plane signals.

4) Costs of Communication Volume

Smartphones are very attractive compared to past UEs because they support large screens and useful user interfaces. It is expected that smartphones will accelerate the accessing of large volumes of content such as music and video. For example, when users simultaneously enjoy the same content by live streaming, a large amount of network resources will be consumed.

2.6 Other Release 11 Requirements

In Sections 2.1 to 2.5, we introduced major Release 11 requirements in 3GPP SA1. Other Release 11 requirements are shown in **Table 2**.

At 3GPP, the Evolved Packet System (EPS) was introduced in Release 8 as a network system for accommodating LTE access [1]. Extensions have been studied [11] since that release.

In Release 11, for example, a mechanism for accommodating authentication and QoS[*11] control requested from the fixed access network in EPS, and interworking with QoS-resource-

*10 **Presence**: A service that provides up-to-date status information on a user.

*11 **QoS**: The level of quality on the network set for each type of service.

Table 2 Study items for Release 11

Function	Requirements
System Improvement for Machine-type Communications	Study network optimization for MTC
Alternative to E.164 for Machine-Type Communications	Study allocation of new identifiers different from telephone numbers to MTC devices
Non-Voice Emergency Services	Study non-voice methods for contacting emergency authorities
IMS Network independent public User Identities	Study requirements for methods that provides SIP URI portability
Mobile Data Applications Impact	Establish countermeasures to network load caused by smartphone applications
USSD Simulation Service in IMS	Provide for IMS the same function as the current one that provides USSD for controlling applications by inputting a character string during communications
QoS Control Based on Subscriber Spending Limits	Lower communications quality (such as transmission speed) once the user has exceeded pre-established spending and data limits
Interworking between Mobile Operators Using Evolved Packet System and Data Application provider	Provide resource allocation, authentication, etc. in a 3GPP system through interworking between the operator's network and a 3rd-party using the latter's applications as a trigger
Support for BBF Accesses Interworking	When accommodating fixed-network access to EPS (system that accommodates LTE access), enable the EPS to provide research allocation, authentication, and policy control with respect to QoS requirements from the fixed-network access

USSD：Unstructured Supplementary Service Data

allocation and authentication functions triggered by 3rd party[*12] applications have been added as new requirements in the specifications.

Furthermore, in the area of charging, the requirement that the network shall be able to reduce the user's data transmission speed once the user has exceeded a data-usage limit set by the telecommunications operator beforehand was added.

3. Release 12 Studies

In addition to the Release 11 requirements introduced above, 3GPP SA1 has already begun discussions on Release 12 study items.

Among these, a study on a use case for direct communication between UEs using LTE access technologies is an attractive topic among telecommunications operators and UE vendors. One reason for this is that such a function could be useful during a disaster, for example. However, there are also issues associated with this function. Operator systems such as base stations and core network entities would not be involved in such communication, which means that the operator could not extract nor charge for the amount of data exchanged in such direct communications between UEs. Furthermore, some countries regulate that a control mechanism by a telecommunications operator is required for all communications.

Also at 3GPP, various items related to femtocells have been studied since Release 9. To given an example, Release 10 provides a local IP access function that enables a user at home to connect to a personal computer from UE via a femtocell placed inside the house. An issue here is that the connection to the personal computer is lost once the user leaves the house. To address this issue, there was a study on mobility requirements that would enable the UE to continuously access the personal computer even when moving from the femtocell to a macrocell.

*12 **3rd party**: A software vendor that develops software for UE.

4. Conclusion

This article provided an overview of items specified as Release 11 and items that have begun to be studied as Release 12 in 3GPP SA1, which studies service requirements for mobile communications networks.

At 3GPP, separate groups are formed to study service requirements, architecture, and protocol. As for the Release 11 requirements introduced here, those to be eventually provided as Release 11 functions will be decided later on the basis of architecture and protocol studies. It can therefore be expected that provided functions might be narrowed down somewhat depending on the study schedule. In other words, there is no guarantee that Release 11 will be provided in its present state. NTT DOCOMO therefore plans to keep up with study trends and continue to make proposals on the basis of standardization needs within the company and demand for functions.

References

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