



**5G;
Application architecture for MSGin5G Service;
Stage 2
(3GPP TS 23.554 version 18.10.0 Release 18)**



Reference

RTS/TSGS-0623554via0

Keywords

5G

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
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Foreword

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Introduction

1 Scope

The present document specifies the functional architecture, procedures, information flows and APIs for MSGin5G Service. MSGin5G Service provides messaging communication capability in 5GS especially for Massive Internet of Things (MIoT).

MSGin5G Service includes the following message communication models:

- Point-to-Point message;
- Application-to-Point message/ Point-to-Application message;
- Group message;
- Broadcast message.

The corresponding service requirements are defined in 3GPP TS 22.262 [2].

MSGin5G Service provides the following capabilities to enhance the message delivery for all message communication models:

- MSGin5G Store and Forward;
- Message communication based on Messaging Topic;
- Message Aggregation;
- Message Segmentation and Reassembly;
- Message Gateway to interwork with non MSGin5G messaging services;
- Usage of Network Capabilities including UE reachability status monitoring and MSGin5G device triggering.

The present specification also defines the usage and interactions of the MSGin5G Service with SEAL services and the utilizing of SEAL functionalities in MSGin5G service.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 22.262: "Message Service within the 5G System".
- [3] GSMA PRD RCC.07: "RCC.07 Rich Communication Suite 9.0 Advanced Communications Services and Client Specification".
- [4] OMA OMA-ERELD-LightweightM2M-V1_1-20180612-C: "Enabler Release Definition for LightweightM2M".
- [5] 3GPP TS 23.434: "Service Enabler Architecture Layer for Verticals".
- [6] 3GPP TS 23.222: "Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs; Stage 2".

- [7] 3GPP TS 23.502: "Procedures for the 5G System".
- [8] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".
- [9] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".
- [10] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".
- [11] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".
- [12] 3GPP TS 23.501: "System Architecture for the 5G System (5GS); Stage 2".
- [13] 3GPP TS 23.204: "Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2".
- [14] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)".
- [15] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".
- [16] 3GPP TS 33.501: "Security architecture and procedures for 5G System".
- [17] 3GPP TS 32.240: "Charging architecture and principles".
- [18] 3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".
- [19] 3GPP TS 23.303: "Proximity-based services (ProSe)".
- [20] 3GPP TS 33.210: "Network Domain Security (NDS); IP network layer security".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

AS-to-Point messaging: an MSGin5G message delivery that is originated at an Application Server in the network and terminated at a UE.

Broadcast Area: an area consisting of one or more cells where the broadcast message is delivered.

Broadcast messaging: an MSGin5G message delivery that is delivered to UEs in a Broadcast Area.

Broadcast Message Gateway: the entity in MSGin5G Service to support delivery Broadcast messages to Legacy 3GPP UEs, Non-3GPP UEs and MSGin5G UEs.

Constrained UE: an MSGin5G UE which cannot connect to the 3GPP network directly for message exchange with MSGin5G Server.

Group messaging: message delivery that is originated at a UE or an Application Server and is terminated at all members of the group (a group member can be of type UE, Legacy 3GPP UE or Non-3GPP UE).

Legacy 3GPP Message Gateway: the entity in MSGin5G Service to support interworking with Legacy 3GPP UEs.

Legacy 3GPP UE: the UE that supports legacy 3GPP message sending and receiving (e.g. SMS, NIDD, etc) in MSGin5G Service.

MSGin5G Client: the client that enables MSGin5G message sending and receiving.

Message Gateway: general terminology for Legacy 3GPP Message Gateway, Non-3GPP Message Gateway, or Broadcast Message Gateway.

MSGin5G Gateway UE: an MSGin5G UE that can provide access to multiple constrained UEs to connect to the 3GPP network for MSGin5G services.

MSGin5G Group: the group of UEs which members may be MSGin5G UE, Legacy 3GPP UE and Non-3GPP UE.

MSGin5G message: the message defined in the present specification that is exchanged between the MSGin5G Service endpoints under the MSGin5G Service.

MSGin5G Server: a server in MSGin5G Service that receives and delivers MSGin5G messages among MSGin5G Service endpoints.

MSGin5G Service: an MNO message service using the 5G System that enables Point-to-Point, AS-to-Point, Point-to-AS, Group and Broadcast message delivery for thing-to-thing communication and person-to-thing communication.

Messaging Topic: an identifier for a topic to which a UE or an Application Server can subscribe to in order to receive messages that are characterized by a Message Topic.

MSGin5G UE: the UE that uses MSGin5G Client in MSGin5G Service.

Non-3GPP Message Gateway: the entity in MSGin5G Service to support interworking with Non-3GPP UEs.

Non-3GPP UE: the UE that supports non-3GPP message sending and receiving (e.g. RCS message as specified in GSMA PRD RCC.07 [3], OMA LWM2M message as specified in OMA OMA-ERELD-LightweightM2M [4]) in MSGin5G Service.

NOTE: The MSGin5G UE utilizes MSGin5G Client in MSGin5G Service. The Legacy 3GPP UE and Non-3GPP UE does not utilize MSGin5G Client in MSGin5G Service.

Non-MSGin5G UE: general terminology for Legacy 3GPP UE or Non-3GPP UE.

Point-to-AS messaging: an MSGin5G message delivery that is originated at a UE and terminated at an Application Server.

Point-to-Point messaging: an MSGin5G message delivery that originates at a UE and terminates at a UE, where at least one of the end points is an MSGin5G UE.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

5GS	5G System
AOMT	AS-Originated Mobile-Terminated
AS	Application Server
BMG	Broadcast Message Gateway
CAPIF	Common API Framework for northbound APIs
MOAT	Mobile-Originated AS-Terminated
MOMT	Mobile-Originated Mobile-Terminated
NIDD	Non IP Data Delivery
SCEF	Service Capability Exposure Function
SCS	Service Capability Server
SEAL	Service Enabler Architecture Layer for Verticals

SMSC Short Message Service Center
VAL Vertical Application Layer

4 Architectural requirements

4.1 General

4.1.1 Description

This subclause specifies the general architecture requirements for MSGin5G Service.

4.1.2 Requirements

[AR-4.1.2-a] The MSGin5G Client shall support one or more applications which need to use the MSGin5G message exchanging capabilities.

[AR-4.1.2-b] The MSGin5G Server shall support one or more Applications Servers which support the MSGin5G message exchanging capabilities.

[AR-4.1.2-c] The MSGin5G messaging related capabilities (e.g. registration, Point-to-Point messaging, Group messaging, message delivery status, etc.) should be exposed as APIs to the Applications Server(s).

[AR-4.1.2-d] The application architecture shall enable the communication between the UEs in different PLMNs. The UEs support MSGin5G Service.

[AR-4.1.2-e] The MSGin5G service should support different application priority levels for the MSGin5G messages including High, Normal and Low.

4.2 UE types

4.2.1 Description

This subclause specifies the requirements for UE types supported by MSGin5G Service.

4.2.2 Requirements

[AR-4.2.2-a] The application architecture shall support the message exchanging between the following UE types:

1. MSGin5G UE:
 - 1) constrained devices (e.g. sensors, actuators) and
 - 2) unconstrained devices with advanced capabilities (e.g. washing machine, micro-ovens)
2. Legacy 3GPP UE
3. Non-3GPP UE

[AR-4.2.2-b] The application architecture shall enable the unconstrained devices to act as a MSGin5G Gateway UE to constrained devices to communicate with MSGin5G Server.

4.3 Communication models

4.3.1 Description

This subclause specifies the requirements for MSGin5G communication models.

4.3.2 Requirements

[AR-4.3.2-a] The application architecture shall support the following message communication models:

- 1 Point-to-Point message;
- 2 Application-to-Point message/ Point-to-Application message;
- 3 Group message;
- 4 Broadcast message.

[AR-4.3.2-b] The application architecture shall support interconnecting between the MSGin5G Service and other different messaging delivery mechanisms, (e.g. SMS as specified in 3GPP TS23.040 [15], or RCS message as specified in GSMA PRD RCC.07 [3]).

4.4 Charging

4.4.1 Introduction

This subclause specifies the charging related requirements for the MSGin5G Service.

4.4.2 Requirements

[AR-4.4.2] The MSGin5G Server shall support collecting charging information from MSGin5G message according to the operator's charging policy including charge per message, charge by amount of data, and flat rate (e.g., per month or per year).

5 Application layer architecture

5.1 General

The following aspects of MSGin5G Service are described in this clause:

- application architecture;
- functional entities;
- reference points;
- capability exposure for enabling MSGin5G Service; and
- service-based interface representation for MSGin5G Service.

5.2 Application Architecture

Figure 5.2-1 shows the application architecture of the MSGin5G service. The MSGin5G service shall fulfil the service requirements which are enumerated in 3GPP TS 22.262 [2] and the architecture requirements enumerated in clause 4.

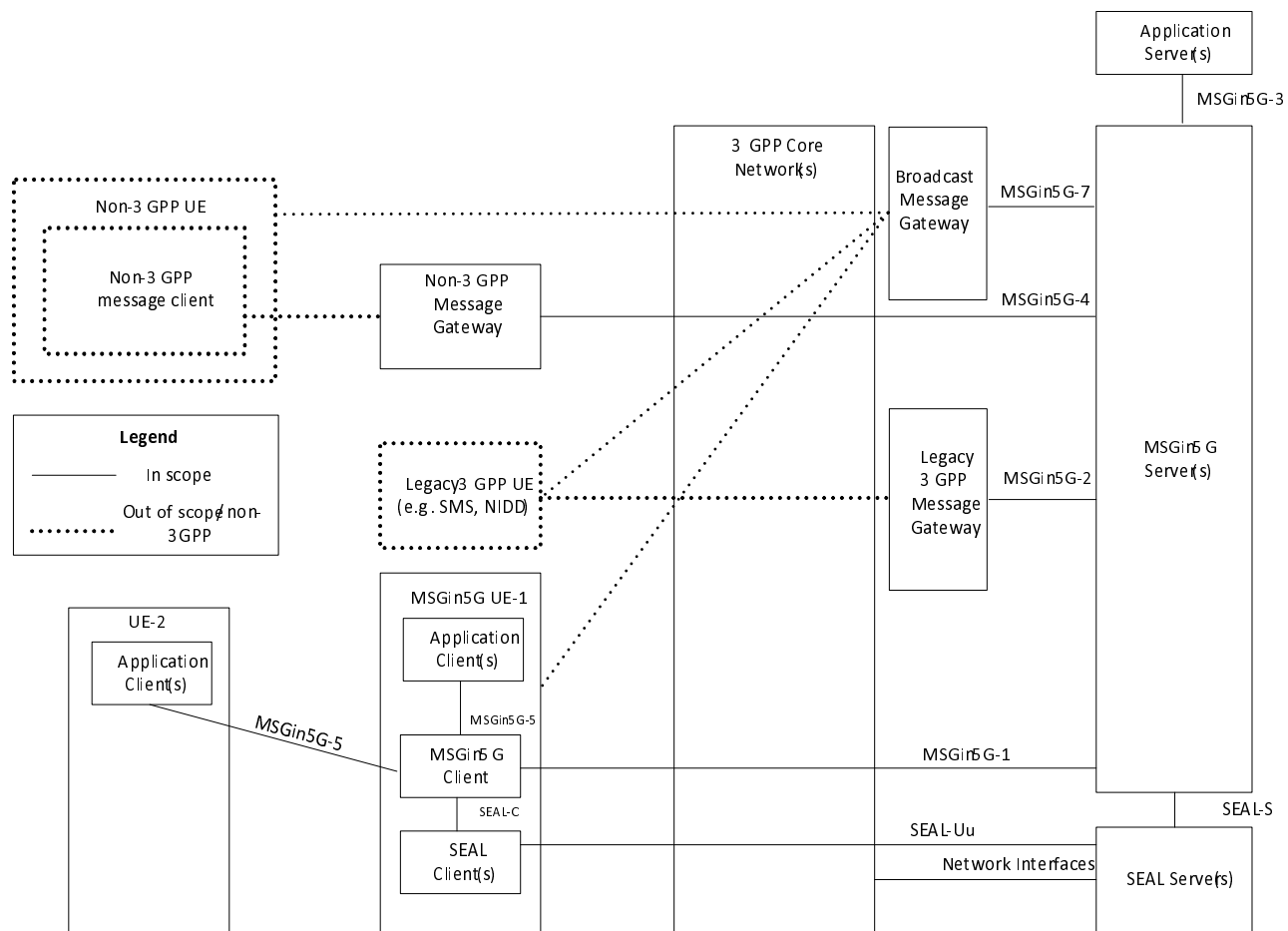


Figure 5.2-1: Application Architecture of the MSGin5G Service

The Application Client resides on the same UE with the MSGin5G Client as shown in MSGin5G UE-1, or resides on a different UE and interacts with the MSGin5G Client over the MSGin5G-5 reference point as shown in UE-2.

The MSGin5G Client(s) interacts with SEAL Clients over the SEAL-C reference point specified for each SEAL service. The MSGin5G Server(s) interacts with SEAL Servers over the SEAL-S reference point specified for each SEAL service. The interaction between a SEAL Client and the corresponding SEAL Server is supported by SEAL-UU reference point specified for each SEAL service as specified in 3GPP TS 23.434 [5].

The MSGin5G UE-1 communicates with MSGin5G Server over MSGin5G-1 reference point.

The Legacy 3GPP Message Gateway interacts with MSGin5G Server over MSGin5G-2 reference point on behalf of Legacy 3GPP UE (e.g., SMS, NIDD).

The Non-3GPP Message Gateway interacts with MSGin5G Server over MSGin5G-4 reference point on behalf of Non-3GPP UE.

The Broadcast Message Gateway interacts with MSGin5G Server over MSGin5G-7 reference point.

NOTE 1: A SEAL Group Management Server and a SEAL Configuration Management Server (both specified in 3GPP TS 23.434 [5]) may be collocated in the MSGin5G Server. A SEAL Configuration Management Client specified in 3GPP TS 23.434 [5] may be collocated in the MSGin5G Client, Legacy 3GPP Message Gateway and Non-3GPP Message Gateway. The implementation of such deployment option is out of scope of the present specification.

NOTE 2: Depending on the non-3GPP message service, the interaction between Non-3GPP message client and Non-3GPP Message Gateway may involve 3GPP Core Network.

NOTE 3: 3GPP Core Network may not be involved for the interaction between the Non-3GPP Message Gateway and the MSGin5G Server.

NOTE 4: If the Application Client on UE-2 communicates with the MSGin5G Client on UE-1 over the MSGin5G-5 reference point then the transport layer communication is based on the Unicast mode 5G ProSe Direct Communication specified in 3GPP TS 23.304 [18] or is implementation specific.

The architecture shown in Figure 5.2-2 and Figure 5.2-3 illustrate architectural options for providing MSGin5G services for constrained devices. In these figures, the MSGin5G UE-2 is a constrained device which does not connect to the 3GPP network directly for message exchange with MSGin5G Server (e.g. UE-2 is out of 3GPP RAN coverage, with or without authorization to use UE-to-Network relay). If allowed by configuration, the MSGin5G UE-2 can use the options listed below to communicate with the MSGin5G Server:

- the MSGin5G UE-2 uses an UE-1 as relay;
- the MSGin5G UE-2 interacts with an MSGin5G Gateway UE which supports MSGin5G Gateway Client.

Figure 5.2-2 shows the application architecture of MSGin5G UE-2 using an UE-1 as a relay. The SEAL Client(s) residing on the UE-1 also acts as relay for the SEAL Client(s) residing on the MSGin5G UE-2 as specified in 3GPP TS 23.434 [5].

NOTE 5: In this option, MSGin5G UE-2 discovers the UE-1 and then uses the UE-1 as a ProSe UE-to-Network Relay by using the procedure specified in 3GPP TS 23.304 [18].

NOTE 6: The UE-1 can be any UE supporting ProSe UE-to-Network Relay capability and may not be an MSGin5G UE.

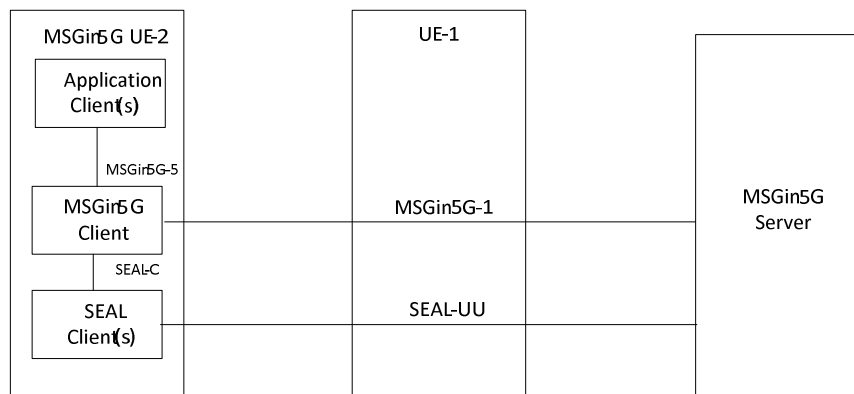


Figure 5.2-2: MSGin5G UE-2 using UE-1 as a relay

Figure 5.2-3 shows the application architecture of MSGin5G UE-2 with MSGin5G Client interacts with an MSGin5G Gateway UE over the MSGin5G-6 reference point. The SEAL Client(s) residing on the UE-2 communicates with the SEAL Client(s) residing on the UE-1 via SEAL-PC5 reference as specified in 3GPP TS 23.434 [5].

NOTE 7: Both MSGin5G Client functionality and MSGin5G Gateway service functionality are internal functionalities of MSGin5G Gateway Client. The interaction between MSGin5G Client functionality in the MSGin5G Gateway Client and the MSGin5G Gateway service functionality is implementation specific.

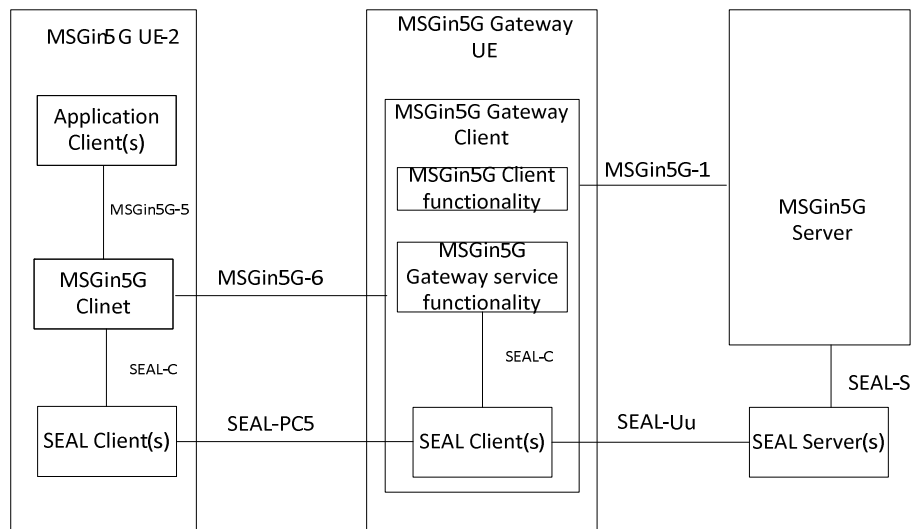


Figure 5.2-3: MSGin5G UE-2 with MSGin5G Client interacts with an MSGin5G Gateway UE

NOTE 8: MSGin5G-6 reference point is based on the Unicast mode 5G ProSe Direct Communication specified in 3GPP TS 23.304 [18].

Figure 5.2-4 illustrates the functional model for interconnection between MSGin5G servers.



Figure 5.2-4: Interconnection between MSGin5G Servers

To support distributed SEAL server deployment in one PLMN, and delivering MSGin5G messages between different PLMNs, the MSGin5G Server interacts with another MSGin5G Server over MSGin5G-8 reference point.

5.3 Functional entities

5.3.1 General

The functional entities of the application architecture for the MSGin5G Service are described in this clause.

5.3.2 MSGin5G Server

5.3.2.1 General functionalities

An MSGin5G Server provides server-side functionality to assist MSGin5G Clients with the sending and receiving of messages via the MSGin5G Service to/from Application Servers and/or other MSGin5G Service endpoints on other UEs, and collect charging information from MSGin5G message.

Functionalities of MSGin5G Server:

- To manage MSGin5G UEs that are home to the MSGin5G Server and provides:
 - handling the registration of these MSGin5G UEs
 - handling the message initiation by these MSGin5G UEs

- handling the message delivery to these MSGin5G UEs
- To deliver messages to an MSGin5G Service endpoint based on the terminating MSGin5G Service ID. The terminating MSGin5G Service ID may be served by the same MSGin5G Server or served by another MSGin5G Server. If the MSGin5G Service ID is served by another MSGin5G Server, the MSGin5G Server forwards the messages to the next MSGin5G Server until it reaches to the MSGin5G Server that is the home of the terminating MSGin5G Service ID;
- To resolve the MSGin5G Group Service ID to determine the members of the Group as specified in 3GPP TS 23.434[5];
- Interworking with non 3GPP messaging service through the Non-3GPP Message Gateway;
- Interworking with legacy 3GPP messaging service through the Legacy 3GPP Message Gateway;
- Interworking with a 3GPP broadcast service through the Broadcast Message Gateway;
- Exchanging MSGin5G messages with Application Servers, MSGin5G Clients, Legacy 3GPP Message Gateway, and Non-3GPP Message Gateway;
- Supporting MSGin5G message segmentation according to service provider's policy;
- Supporting UE configuration procedures as specified in TS 23.434 [5] or communicating with the SEAL Configuration Management Server to provide MSGin5G configuration data on a UE to be ready for the MSGin5G Service;
- Managing information related to the MSGin5G Service, such as MSGin5G Client Triggering Information, MSGin5G Client availability and MSGin5G Client Supported MSGin5G segment size, and Broadcast Message Gateway;
- Support store and forward of messages based on the sender request and the availability and reachability of the service endpoints, and
- Interactions towards the CHF, as defined in TS 32.240 [17], to collect charging information from MSGin5G message according to the operator's charging policy and report charging information to CHF.

NOTE: The details of charging function are out of scope of the present document.

5.3.2.2 Target resolution

Upon receiving the MSGin5G message request to deliver the message to the recipient (which could be any of the MSGin5G UE, Legacy 3GPP UE, Non-3GPP UE or Application Server), the MSGin5G Server checks the recipient's registration status (created at the time of each MSGin5G UE/Application Server registration to MSGin5G Server, or the Message Gateway performs registration with the MSGin5G Server on behalf of the Non-MSGin5G UEs) for availability and reachability of MSGin5G service endpoints. The MSGin5G Server will attempt for delivery of the MSGin5G message request towards recipient based on the UE Service ID/AS Service ID, if the recipient is available and reachable. If the recipient is unavailable, the MSGin5G Server stores the message for deferred delivery unless the sender or the recipient opted out of store and forward services.

NOTE: If reachability monitoring (see clause 8.9.2) is not used or the recipient is not an MSGin5G UE, the MSGin5G Server assumes the recipient is reachable.

If the recipient is Non-MSGin5G UE, the Legacy 3GPP Message Gateway or the Non-3GPP Message Gateway that the Non-MSGin5G UE is registered with, will receive the MSGin5G message request on behalf of the Non-MSGin5G UE, and then delivers the message to the Non-MSGin5G UE by using the Non-MSGin5G message delivery mechanism.

If the message is a Broadcast message, the Broadcast Message Gateway will receive the MSGin5G message request and will deliver the message to all UEs in the Broadcast Area via the Broadcast messaging delivery mechanism, based on the Broadcast Area ID.

5.3.3 MSGin5G Client

5.3.3.1 General functionalities of MSGin5G Client

An MSGin5G Client provides client-side functionality for UE Application Clients with the sending and receiving of messages via the MSGin5G Service to/from Application Servers and/or other MSGin5G Service endpoints; i.e. UEs.

Functionalities of MSGin5G Client including:

- may expose MSGin5G APIs to enable Application Clients to use an MSGin5G Service;
- supporting (de-)registration of an MSGin5G Client to an MSGin5G Server to use MSGin5G Service;
- supporting configuration of an MSGin5G Client required to use MSGin5G Service;
- construction of MSGin5G message when requested by a native application or Application Client;
- delivery of MSGin5G message payload to the targeted native application or Application Client;
- exchanging MSGin5G messages via an MSGin5G Server to/from Application Servers and/or other MSGin5G Service endpoints; i.e. UEs;
- support MSGin5G message segmentation and re-assembly;
- support MSGin5G message aggregation and segregation

NOTE 1: A native application on an MSGin5G UE is the application logic built within the MSGin5G Client.

NOTE 2: An MSGin5G Client residing in a constrained device is the same as an MSGin5G Client residing in an unconstrained device. i.e. both of them use the same transport/data formats and have the same capabilities.

5.3.3.2 MSGin5G Gateway Client

An MSGin5G Gateway Client is an MSGin5G Client which supports MSGin5G Gateway service functionality in addition to the MSGin5G Client functionalities specified in clause 5.3.3.1. It enables constrained devices to obtain services from the MSGin5G Server when communications via ProSe UE-to-Network Relay are not or cannot be supported.

The MSGin5G Gateway service functionality in the MSGin5G Gateway Client supports:

- supporting the bulk configuration and bulk (de-)registration for the MSGin5G Client residing on the Constrained UE, e.g. checking whether bulk configuration/bulk (de-)registration can be used, holding the (de-)registration request from MSGin5G Client residing on the constrained device, construction of the bulk (de-)registration request and splitting of the MSGin5G UE bulk (de-)registration response.

NOTE: Whether other capabilities, e.g. detailing of the support for (de-)registration of constrained devices, are needed to be supported by MSGin5G Gateway service functionality is out of scope of the present document.

5.3.4 Message Gateway

5.3.4.1 General Description of Message Gateway

A Message Gateway in the MSGin5G application architecture provides functionality to deliver MSGin5G messages to Non-MSGin5G UEs.

NOTE 1: It is an implementation option to deliver broadcast messages to Legacy 3GPP UEs and MSGin5G UEs (see Figure 5.2-1).

A Message Gateway performs the role of interconnecting two different messaging delivery mechanisms and assures the message integrity between different message delivery mechanisms. A message delivery mechanism comprises the specific set of protocols, procedures and rules.

Functionalities of Message Gateway:

- Enables seamless delivery of an MSGin5G message between different message delivery mechanisms with integrity;
- Communicates with the MSGin5G Server using either an MSGin5G Client functionality or similar functions to enable sending and receiving MSGin5G messages;
- Delivers payload of an MSGin5G message to the Non-MSGin5G UE using the specific message delivery mechanism available to that Non-MSGin5G UE and vice versa;
- Performs message sender and receiver addresses conversion according to the two connected message delivery mechanisms and maintain the mapping of the address pair used for a response message delivery;
- Perform registration and de-registration with the MSGin5G Server on behalf of the Non-MSGin5G UEs;
- Act as a service endpoint to perform message segmentation and reassembly for the Non-MSGin5G UEs when needed;
- Act as a service endpoint to split the aggregated MSGin5G message into multiple individual MSGin5G message requests for the Non-MSGin5G UEs; and
- Performs protocol conversion according to the service supported by the target UE;
- Supports the MSGin5G message delivery status report
 1. If application level message delivery status report is not supported by the Non-MSGin5G message delivery mechanisms, based on the information (e.g. response to the message delivery request, transport level information, etc) obtained from the Non-MSGin5G message delivery mechanisms, the Message Gateway fetches the delivery status from the above information and uses it to create an MSGin5G message delivery status report on behalf of Non-MSGin5G UE. If the delivery status is failure, also fetch the suitable failure reason from the above information and use it as reason of failure in the MSGin5G message delivery status report.
 2. If application level message delivery status report is supported by the Non-MSGin5G message delivery mechanisms (e.g. RCS specified in GSMA PRD RCC.07 [3]), translates the application level message delivery status report in the Non-MSGin5G message delivery mechanisms to MSGin5G message delivery status report.

There are three types of Message Gateways used to deliver MSGin5G messages to different UE types: the Legacy 3GPP Message Gateway, the non-3GPP Message Gateway, and the Broadcast Message Gateway.

NOTE 2: Implementation of the Message Gateway and the MSGin5G Server together is a deployment option that is out of scope the present specification.

5.3.4.2 Legacy 3GPP Message Gateway

The Legacy 3GPP Message Gateway is used to deliver MSGin5G message to Legacy 3GPP UEs, using their 3GPP supported message delivery mechanisms.

5.3.4.3 Non-3GPP Message Gateway

The Non-3GPP Message Gateway is used to deliver MSGin5G message to Non-MSGin5G UEs, using their (non-3GPP) supported message delivery mechanisms.

5.3.4.4 Broadcast Message Gateway

The Broadcast Message Gateway is used to deliver MSGin5G message to MSGin5G UEs, Legacy 3GPP UEs or Non-MSGin5G UEs in a Broadcast Area.

5.3.5 Application Client

The Application Client is an entity in the application layer to implement and perform the application service logic for its own service.

The Application Client interacts with MSGin5G Client for on the same or different UE sending and receiving MSGin5G messages. The Application Client provides needed information for the MSGin5G Client to perform MSGin5G Service with other endpoints.

5.3.6 Application Server

The Application Server is an entity in the application layer to implement and perform the application service logic.

The Application Server supports sending and receiving messages with MSGin5G Service layer protocols and procedures.

5.3.7 Legacy 3GPP Message Client

The Legacy 3GPP Message Client provides client-side functionality for a Legacy 3GPP messaging service (e.g. SMS, NIDD).

NOTE: The details of the Legacy 3GPP Message Client are out of scope of the present document.

5.3.8 Non-3GPP Message Client

The Non-3GPP Message Client provides client-side functionality for a Non-3GPP messaging service.

NOTE: The details of the Non-3GPP message client are out of scope of the present document.

5.3.9 SEAL Client

The following SEAL Clients for MSGin5G Service are supported:

- Group management client as specified in 3GPP TS 23.434 [5];
- Configuration management client as specified in 3GPP TS 23.434 [5].

5.3.10 SEAL server

The following SEAL servers for MSGin5G Service are supported:

- Group management server as specified in 3GPP TS 23.434 [5];
- Configuration management server as specified in 3GPP TS 23.434 [5].

NOTE: Usage of other SEAL services (e.g. location) from 3GPP TS 23.434 [5] for MSGin5G Service is not in scope of the present document.

5.4 Reference Points

5.4.1 General

The reference points of the service architecture for the MSGin5G Service are described in this clause.

5.4.2 MSGin5G-1

The interactions related to enabling MSGin5G message exchange between an MSGin5G Client and an MSGin5G Server are supported by the MSGin5G-1 reference point. This reference point supports:

- Registration of an MSGin5G Client to an MSGin5G Server when not using IMS based solution; and
- The exchange of MSGin5G messages.

5.4.3 MSGin5G-2

The interactions related to enabling MSGin5G message exchange between an MSGin5G Server and the Legacy 3GPP Message Gateway are supported by the MSGin5G-2 reference point. This reference point supports:

- The exchange of MSGin5G messages between MSGin5G Server and the Legacy 3GPP Message Gateway; and
- Perform registration /de-registration on behalf of the Legacy 3GPP UEs that the Message Gateway connects with the MSGin5G Server.

NOTE: Indicating the delivery mechanism on the MSGin5G-2 reference point is out of scope of current functionality.

5.4.4 MSGin5G-3

The interactions related to enabling MSGin5G message exchange between an Application Server and an MSGin5G Server are supported by the MSGin5G-3 reference point. This reference point supports:

- Access to MSGin5G Server and APIs to enable sending and receiving of MSGin5G messages; and
- Adherence to CAPIF as specified in 3GPP TS 23.222 [6].

5.4.5 MSGin5G-4

The interactions related to enabling MSGin5G message exchange between a Non-3GPP Message Gateway and an MSGin5G Server are supported by the MSGin5G-4 reference point. This reference point supports:

- The exchange of MSGin5G messages between MSGin5G Server and the Non-3GPP Message Gateway; and
- Perform registration/de-registration on behalf of the Non-3GPP UEs that the Message Gateway connects with the MSGin5G Server

5.4.6 MSGin5G-5

The interactions related to enabling MSGin5G message related information exchange between an Application Client and an MSGin5G Client are supported by the MSGin5G-5 reference point. The Application Client can reside on the same UE with the MSGin5G Client or reside on a different UE. This reference point supports:

- Providing information from Application Clients required to enable the MSGin5G Client to construct an MSGin5G message to be delivered to other MSGin5G Service endpoints.
- Configuring application clients with information required to enable the MSGin5G Client and MSGin5G Server to exchange and route MSGin5G messages to other MSGin5G Service endpoints.
- Sending notifications and information in the incoming MSGin5G messages received by the MSGin5G Client to the Application Clients from other MSGin5G Service endpoints.

5.4.7 MSGin5G-6

The MSGin5G Client of MSGin5G UE-2 communicates with MSGin5G Gateway service functionality residing on an MSGin5G Gateway UE over MSGin5G-6 reference point. The interface is based on Unicast mode 5G ProSe Direct Communication specified in 3GPP TS 23.304 [18].

5.4.8 SEAL-C

The following SEAL-C reference points for MSGin5G Service are supported:

- GM-C reference point for group management as specified in 3GPP TS 23.434 [5];
- CM-C reference point for configuration management as specified in 3GPP TS 23.434 [5].

5.4.9 SEAL-S

The following SEAL-S reference points for MSGin5G Service are supported:

- GM-S reference point for group management as specified in 3GPP TS 23.434 [5];
- CM-S reference point for configuration management as specified in 3GPP TS 23.434 [5].

5.4.10 SEAL-UU

The following SEAL-UU reference points for MSGin5G Service are supported:

- GM-UU reference point for group management as specified in 3GPP TS 23.434 [5];
- CM-UU reference point for configuration management as specified in 3GPP TS 23.434 [5].

5.4.11 MSGin5G-7

The MSGin5G-7 reference point is used by the MSGin5G Server to communicate with the Broadcast Message Gateway to deliver Broadcast messages.

5.4.12 MSGin5G-8

The MSGin5G-8 reference point is used by the MSGin5G Server to communicate with another MSGin5G Server to deliver messages to the MSGin5G Service endpoint which is served by the other MSGin5G Server, and for message exchange related to Messaging Topic (un)subscriptions.

5.5 Capability exposure for enabling MSGin5G Service

5.5.1 MSGin5G application enabler layer adaptation to CAPIF

The MSGin5G Server and Application Server may support CAPIF. When CAPIF is supported:

- The MSGin5G Server shall support the CAPIF API provider domain functions (i.e. CAPIF-2/2e, CAPIF-3/3e, CAPIF-4/4e and CAPIF-5/5e as specified in 3GPP TS 23.222 [6]) as shown in Figure 5.5.1-1;
- The Application Server shall act as API invoker and support the API invoker functions (i.e. CAPIF-1/1e and CAPIF-2/2e as specified in 3GPP TS 23.222 [6]) as shown in Figure 5.5.1-1.

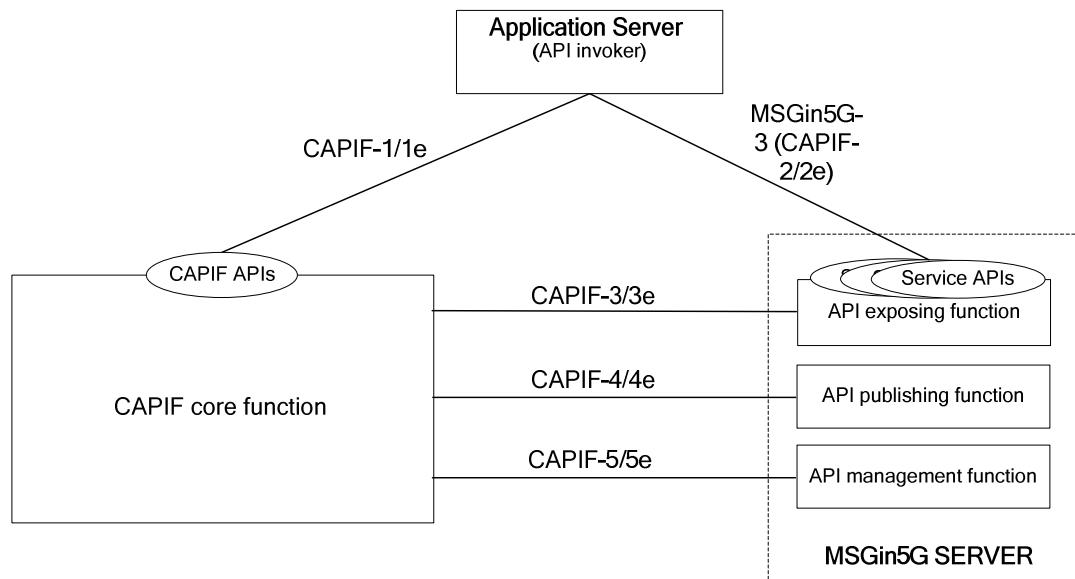


Figure 5.5.1-1: MSGin5G adaptation to the CAPIF architecture

5.6 Service based interface representation for MSGin5G Service

5.6.1 General

The Service based architecture for MSGin5G Service is represented using functional entities and reference points between the functional entities as specified in clause 5.

5.6.2 Service based architecture

Figure 5.6.2-1 is the Service based Architecture for MSGin5G Service.

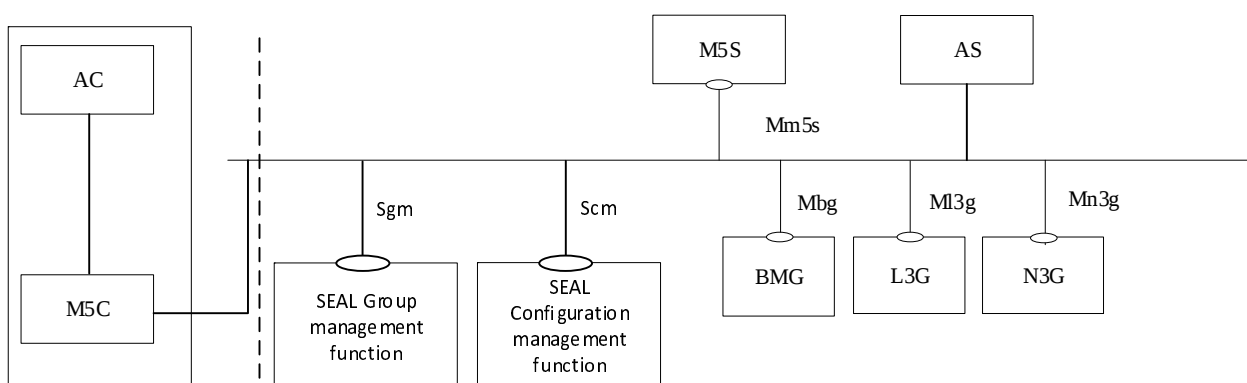


Figure 5.6.2-1: Service based MSGin5G Architecture

NOTE: The AS, BMG, L3G and N3G in this Service based MSGin5G Architecture are in the same trust domain.

The M5S function is a service based function exhibited by MSGin5G Server.

The M5C function is the MSGin5G Client.

The AC is the Application Client.

The L3G function is a service based function exhibited by Legacy 3GPP Message Gateway.

The N3G function is a service based function exhibited by Non-3GPP Message Gateway.

The BMG function is a service based function exhibited by the Broadcast Message Gateway.

The M5S manages the distribution of the messages it has received from MSGin5G UE, from Application Server, or from N3G (on behalf of Non-3GPP UE) or from L3G (on behalf of Legacy 3GPP UE).

The M5S invokes services provided by L3G/N3G/BMG to send MSGin5G messages towards Legacy 3GPP UE, Non-3GPP UE, or the broadcast delivery mechanism.

The AS/L3G/N3G invokes services provided by M5S to send MSGin5G messages to M5S on behalf of Legacy 3GPP UE or Non-3GPP UE.

The M5S invokes services provided by SEAL Group management function to do MSGin5G Group management.

The M5S/L3G/N3G invokes services provided by SEAL Configuration management function to do service configuration (including UE service ID provisioning).

5.6.3 Service based interfaces

Table 5.6.3-1 specifies the service based interfaces supported by MSGin5G Service.

Table 5.6.3-1: Service based interfaces supported by MSGin5G Service

Service based interface	Application function entity	Mapping server entity	APIs offered
Mm5s	MSGin5G Server function	MSGin5G Server	Specified in 9.1
MI3g	Legacy 3GPP Message Gateway function	Legacy 3GPP Message Gateway	Specified in 9.2.1
Mn3g	Non-3GPP Message Gateway function	Non-3GPP Message Gateway	Specified in 9.2.2
Mbg	Broadcast Message Gateway function	Broadcast Message Gateway	Specified in 9.2.3

6 Identities

6.1 Identities for MSGin5G Service endpoints

6.1.1 General

MSGin5G Service endpoints shall be identified by unique identifiers within the MSGin5G Service domain. For each MSGin5G Service endpoint the identifier shall be a unique URI that can be used to identify the MSGin5G Service endpoint's home service domain.

The following clauses describe different types of MSGin5G Service endpoint identifiers.

6.1.2 UE Service Identity (UE Service ID)

UE Service ID is the identifier of a UE (i.e. MSGin5G UE, Legacy 3GPP UE or Non-3GPP UE).

For an MSGin5G UE, the assigned UE Service ID is used by the MSGin5G Client to register with the MSGin5G Server and to send and receive MSGin5G messages. It is used by the MSGin5G Server to authenticate and authorize the associated UE to the MSGin5G Service at the application layer.

For a Legacy 3GPP UE or a Non-3GPP UE, the assigned UE Service ID is used by the Message Gateway to register with the MSGin5G Server on behalf of Legacy 3GPP UE or Non-3GPP UE, to map into the Service ID in their defined message delivery mechanisms for interworking, and to send/receive MSGin5G messages to/from MSGin5G Server on behalf of Legacy 3GPP UE or Non-3GPP UE.

6.1.3 Application Server Service Identity (AS Service ID)

AS Service ID is the identifier of an Application Server. It is used to perform mutual authentication with the MSGin5G Server for establishing a secured service connection, and it is used to send/receive message API request/response to/from other MSGin5G Service endpoints via MSGin5G Server.

6.1.4 Message Gateway Service Identity (MGW Service ID)

MGW Service ID is the identifier of Message Gateway. It is used to perform mutual authentication with the MSGin5G Server for establishing a secured service connection.

6.2 MSGin5G Group Service Identity (Group Service ID)

The Group Service ID is a unique identifier within the MSGin5G Service that represents a pre-defined MSGin5G Group. A pre-defined MSGin5G Group is established before the MSGin5G Group messages are sent to it, and is assigned a unique and permanent Group Service ID when it is established. This Group Service ID shall be communicated to all members of the group. A service endpoint (MSGin5G UE or Application Server) shall use this Group Service ID to send a message to all members of the group.

The Group Service ID shall be a unique URI that can be used to identify where the group is hosted.

6.3 Broadcast Area Service Identity (Broadcast Area ID)

The Broadcast Area ID is the identity of the Service Area where the broadcast message is delivered.

6.4 MSGin5G UE Identity (MSGin5G UE ID)

The MSGin5G UE ID is a unique identifier that represents the MSGin5G UE (i.e. the device identifier of the MSGin5G UE). The MSGin5G UE ID may be pre-configured to the MSGin5G UE by its vendor.

6.5 Non-MSGin5G UE identity (Non-MSGin5G UE ID)

The Non-MSGin5G UE ID is a unique identifier that represents the Non-MSGin5G UE. A Non-MSGin5G UE ID is associated with a specific Non-MSGin5G UE. It is used by the Message Gateway in the MSGin5G Service to record the Non-MSGin5G UE. It is also used by the Message Gateway as a part of VAL UE ID when the Message Gateway executes the Non-MSGin5G UE configuration procedure on behalf of a Non-MSGin5G UE. The format of Non-MSGin5G UE ID may differ among different VALs. The non-MSGin5G ID may be pre-configured to the Non-MSGin5G UE by its vendor.

6.6 Application Identity (Application ID)

Application ID is an identifier that represents the application for which the payload of message is intended. The content of Application ID is outside the scope of this document.

6.7 MSGin5G Server address

MSGin5G Server address is the identifier of an MSGin5G Server within an MSGin5G service provider's domain. The MSGin5G Service endpoints in this MSGin5G service provider's domain can contact an MSGin5G Server by using the MSGin5G Server address of this MSGin5G Server.

7 Generic description of the MSGin5G Service (informative)

7.1 General

Massive Internet of Things (MIoT) is one of key market segments of 5G. The typical IoT device communication is sending and receiving small data which can be delivered just in a message. The MSGin5G Service is designed and optimized for massive IoT device communication including thing-to-thing communication and person-to-thing communication.

The MSGin5G Service is a message enabler for applications. An Application Client in a UE utilizes MSGin5G Service to send a message to another UE, to multiple UEs or to the Application Server, or the Application Server utilizes the MSGin5G Service to send a message to a UE or to multiple UEs. All messages will be routed via the MSGin5G Server in the 5G system. The MSGin5G Service flow is shown in figure 7.1-1.

If the UE supports a legacy 3GPP message service (e.g. SMS, NIDD, or CB) and does not support the MSGin5G Service (i.e. UE has no MSGin5G Client), the message will be translated to the appropriate message delivery mechanism by the Legacy 3GPP Message Gateway. A UE that does not support any 3GPP message service can connect to the MSGin5G Service via Non-3GPP Message Gateway that facilitates the translation between the MSGin5G Service and non-3GPP message delivery mechanism. The connection between such UE and the gateway can be via 3GPP access or non 3GPP access (e.g. WLAN) and is out of scope of the present specification.

An Application Server resides outside the 3GPP domain and connects to the MSGin5G Server via a CAPIF-aware reference point.

The message communication models include:

- Point-to-Point messaging: message that is originated at a UE (UE A) and terminated at another UE (UE B, a Legacy 3GPP UE or a Non-3GPP UE).
- AS-to-Point messaging: message that is originated at an Application Sever and terminated at a UE.
- Point-to-AS messaging: message that is originated at a UE and terminated at an Application Sever.
- Group Messaging: message that is originated at a UE or an Application Server and is terminated at a group of UEs (a group member can be of type UE A, Legacy 3GPP UE or Non-3GPP UE).
- Broadcast Messaging: message that is originated at an Application Sever or an MSGin5G UE and broadcasted to all the UEs in a specific Broadcast Area within coverage of a cell or of multiple cells. An existing broadcast function (e.g. CB specified in 3GPP TS 23.041 [14]) may be reused in broadcast messaging of MSGin5G Service.
- Topic Messaging: message that is originated at an Application Sever or a UE and is delivered to all UEs and Application Server(s) that have subscribed to the topic.

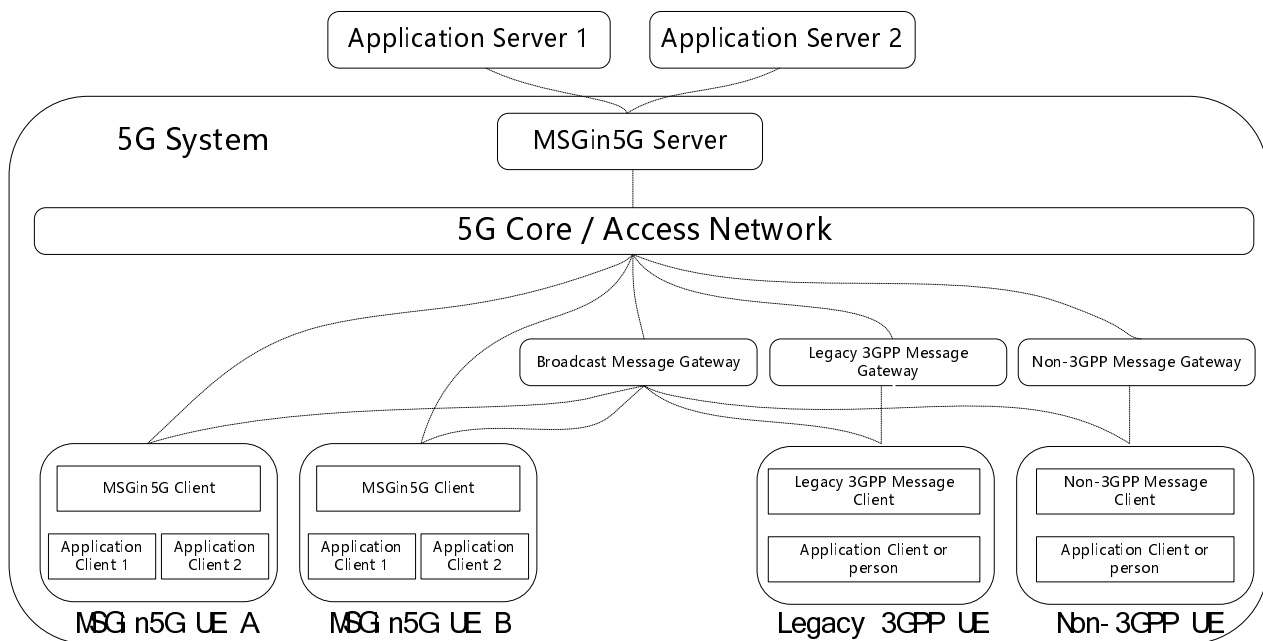


Figure 7.1-1: The MSGin5G Service overview

7.2 Service flow

Before a UE or an Application Server can use the MSGin5G Service it needs to register with the MSGin5G Server.

A UE registers with its identity, its security credentials, the capabilities that it supports, and its availability. The MSGin5G Server will use the availability registration and de-registration to determine if the UE is available for message delivery. If a UE is unavailable for message delivery, the MSGin5G Server will store the message and deliver it once the UE becomes available again.

When a UE or an Application Server sends an MSGin5G message to a recipient UE then such message will be sent to the MSGin5G Server and this server will deliver the message to the UE based on the capabilities of the recipient UE (MSGin5G UE, Legacy 3GPP UE or Non-3GPP UE). If the recipient UE is a Legacy 3GPP UE then the MSGin5G Server will forward the message to the Legacy 3GPP Message Gateway and this gateway will convert the message to a message that is supported by the recipient UE (e.g. SMS, NIDD or CB). If the recipient UE is a Non-3GPP UE then the MSGin5G Server will forward the message to the Non-3GPP Message Gateway and this gateway will convert the message to a message that is supported by the recipient UE.

A Legacy 3GPP UE sends the application payload to the Legacy 3GPP Message Gateway and this gateway will forward the application payload in an MSGin5G message to the MSGin5G Server, which will deliver the message to the recipient UE(s). A Non-3GPP UE sends the application payload to the Non-3GPP Message Gateway and this gateway will forward the application payload in an MSGin5G message to the MSGin5G Server, which will deliver the message to the recipient UE(s).

NOTE: Conversion by a Message Gateway is out of scope of the present specification.

If a UE or an Application Server sends an MSGin5G message to a group of UEs, the MSGin5G Server will deliver the message to all group members taking into account if such a UE is an MSGin5G UE, a Legacy 3GPP UE or a Non-MSGin5G UE and if such UE is available for delivery.

If a UE or an Application Server sends an MSGin5G message containing a Messaging Topic to the MSGin5G Server, the MSGin5G Server will distribute the message to all UEs and Application Servers that have subscribed to that topic.

If a UE or an Application Server sends a broadcast message to a Broadcast Area, the MSGin5G Server forwards the message to the Broadcast Message Gateway and this gateway will forward the message to the broadcast function.

An originating UE or Application Server may request the recipient UE(s) to acknowledge reception of the message. If such a request is made, a message delivery status report shall be sent by the recipient MSGin5G UE or the Message Gateway (on behalf of the Non-MSGin5G UE) as a point-to-point message back to the originating UE or Application

Server. The acknowledgement information is included in the payload and the format of this information is out of scope of the present specification.

The Non-MSGin5G UE may respond to an incoming MSGin5G message; it is subject to the Message Gateway implementation to maintain the transaction of the incoming MSGin5G message and reply to it to the sender, with the response it receives from the Non-MSGin5G UE.

7.3 Message delivery flow at MSGin5G Server

Figure 7.3-1 shows the flow for message delivery by the MSGin5G Server.

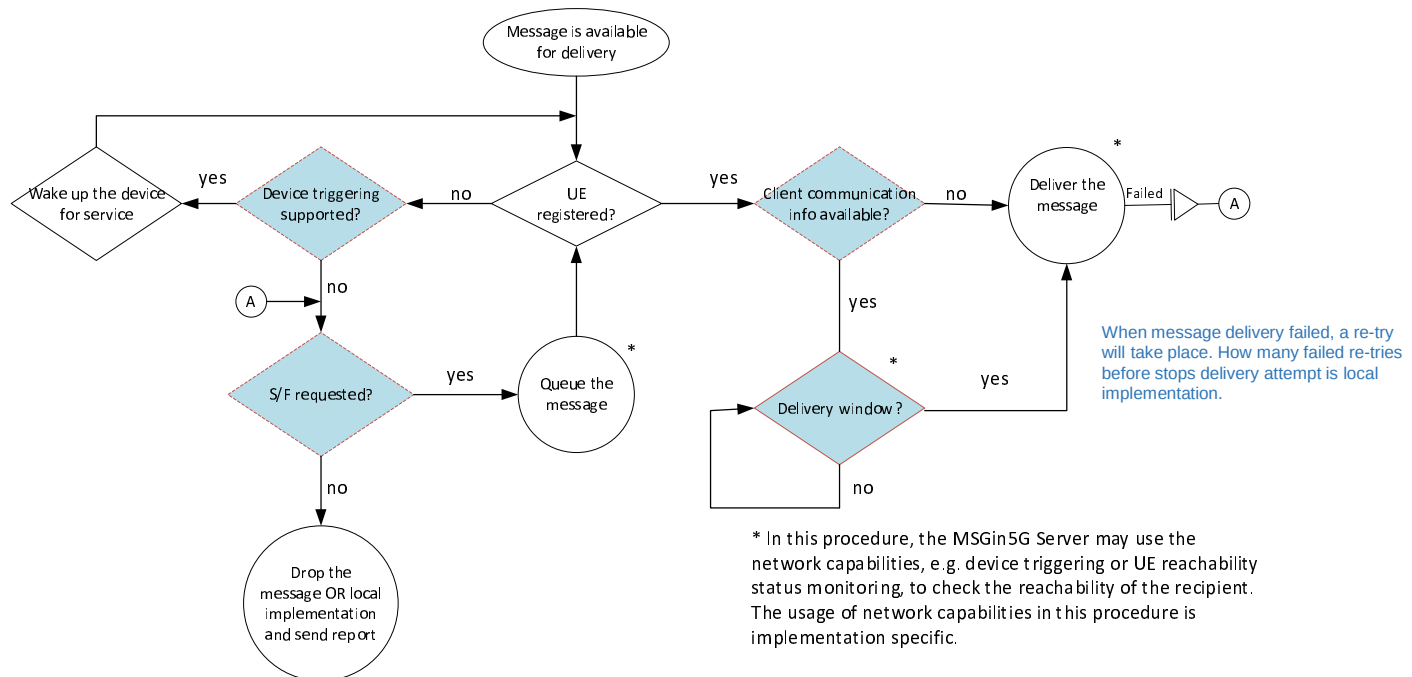


Figure 7.3-1: The message delivery flow at the MSGin5G Server

8 Procedures and information flows

8.1 Configuration

8.1.1 General

The configuration procedure is used to get the MSGin5G Service configuration information (e.g. UE Service ID). The configuration procedure is used by the MSGin5G UE or used by Message Gateway on behalf of the Non-MSGin5G UE. The MSGin5G Service configuration information is used in the future messaging communication.

The VAL UE configuration data specified in TS 23.434 [5] is used in this configuration procedure. After the configuration procedure, the MSGin5G UE, or the Message Gateway on behalf of the Non-MSGin5G UE can register to MSGin5G Server.

NOTE 1: The configuration on the Message Gateway to support the Non-MSGin5G UE for MSGin5G Service can also be done without using the SEAL configuration procedures and is implementation specific.

NOTE 2: The MSGin5G Service configuration information can also be pre-configured to the MSGin5G UE/Non-MSGin5G UE and is implementation specific.

8.1.2 MSGin5G UE Configuration

In the MSGin5G UE configuration procedure, the MSGin5G UE acts as Configuration management client specified in 3GPP TS 23.434 [5].

The following steps of configuration management service apply for the MSGin5G UE:

- Send the Get VAL UE configuration request specified in clause 11.3.2.1 of 3GPP TS 23.434 [5];
- Receive the related Get VAL UE configuration response specified in clause 11.3.2.2 of 3GPP TS 23.434 [5];

The usage of the above information flows is clarified as below:

- The MSGin5G UE ID works as VAL UE ID which is mandatory in the Get VAL UE configuration request;
- The UE Service ID works as VAL user ID;
- The service identifier of MSGin5G Service works as VAL service ID;

Besides the IEs specified in clause 11.3.2.1 of 3GPP TS 23.434 [5], the information in table 8.1.2-1 is also included in the Get VAL UE configuration request.

Table 8.1.2-1: Additional Information in the Get VAL UE configuration request

Information element	Status	Description
MSGin5G UE information	O	Other information needed by the configuration procedure. (see NOTE)
NOTE: The information can be the device type, device vendor, etc. It is specified by application provider or MSGin5G Service provider and is out of scope of this document. The MSGin5G Service provider can configure the MSGin5G UE with different configuration data based on this IE. E.g. all sensors can be configured to a same MSGin5G Server.		

The information in table 8.1.2-2 is included in the Get VAL UE configuration response as a part of VAL UE configuration data.

Table 8.1.2-2: Information in the Get VAL UE configuration response

Information element	Status	Description
UE Service ID	M	UE Service ID assigned to the requesting MSGin5G UE.
MSGin5G Server address	M	The MSGin5G Server which serves this MSGin5G UE.
MSGin5G Service specific information	O	The specific information of the MSGin5G Service specified by the MSGin5G Service provider. (see NOTE)
NOTE: E.g. the segment size of MSGin5G message in this service provider. The detailed definition is out of scope of this document.		

Besides the functionalities of Configuration Management Server specified in 3GPP TS 23.434 [5], the MSGin5G Configuration Function should also check whether the MSGin5G UE ID (i.e. VAL UE ID) is included in a former Get VAL UE configuration request.

- If so, the MSGin5G Configuration Function included the UE Service ID assigned to the MSGin5G UE in the former configuration procedure as a part of VAL UE configuration data,
- Otherwise, a new UE Service ID is assigned to the MSGin5G UE and included in the VAL UE configuration data.

Then the MSGin5G Configuration Function processes the configuration request according to the service policy.

8.1.3 Message Gateway Configuration for support of Non-MSGin5G UE

The Message Gateway performs the configuration procedure on behalf of the Non-MSGin5G UE to get the MSGin5G Service configuration information (e.g. UE Service ID).

NOTE 1: As an alternative to the configuration procedure all the necessary service information (including the UE Service ID) of a Non-MSGin5G UE can be pre-configured with the Message Gateway.

If Configuration Management service in SEAL is used for the Message Gateway configuration, the Message Gateway acts as Configuration management client specified in 3GPP TS 23.434 [5] on behalf of each Non- MSGin5G UE.

The following steps of configuration management service may apply for the Message Gateway:

- Send the Get VAL UE configuration request specified in clause 11.3.2.1 of 3GPP TS 23.434 [5];
- Receive the related Get VAL UE configuration response specified in clause 11.3.2.2 of 3GPP TS 23.434 [5];

The usage of the above information flows is clarified as below:

- An Information Element contains both Non-MSGin5G UE ID and MGW Service ID works as VAL UE ID which is mandatory in the Get VAL UE configuration request;

NOTE 2: The Non-MSGin5G UE ID may differ among different VALs and may not be unique among different Gateways. It is not enough to use only Non-MSGin5G UE ID as VAL UE ID.

- The UE Service ID works as VAL user ID;
- The service identifier of MSGin5G Service works as VAL service ID;

Besides the IEs specified in clause 11.3.2.1 of 3GPP TS 23.434 [5], the information in table 8.1.3-1 is also included in the Get VAL UE configuration request.

Table 8.1.3-1: Additional Information in the Get VAL UE configuration request

Information element	Status	Description
Non-MSGin5G UE information	O	Other information needed by the configuration procedure. (see NOTE)
NOTE: The information can be the device type, device Vendor, etc. It is specified by application provider or MSGin5G Service provider and is out of scope of this document. The MSGin5G Service provider can configure the Non-MSGin5G UE with different configuration data based on this IE. E.g. all sensors can be configured to a same MSGin5G Server.		

The information in table 8.1.3-2 is included in the Get VAL UE configuration response as a part of VAL UE configuration data. The information is used by Message Gateway to support non-MSGin5G UEs that will be used to register with the MSGin5G Server for MSGin5G service.

Table 8.1.3-2: Information in the Get VAL UE configuration response

Information element	Status	Description
UE Service ID	M	UE service ID assigned to the requesting Non-MSGin5G UE.
MSGin5G Server address	M	The MSGin5G Server which serves this MSGin5G UE.
MSGin5G Service specific information	O	The specific information of the MSGin5G Service specified by the MSGin5G Service provider. (see NOTE)
NOTE: The information (except UE Service IE) used by Message Gateway to support non-MSGin5G UEs that will be used to register with the MSGin5G Server for MSGin5G service is included in this IE. The detailed information is specified in Table 8.2.1-1. Other service specific information can also be included in this IE, the detailed definition of the other service specific information is out of scope of this document.		

Besides the functionalities of Configuration Management Server specified in 3GPP TS 23.434 [5], the MSGin5G Configuration Function should also check whether the MSGin5G UE ID (i.e. VAL UE ID) is included in a former Get VAL UE configuration request.

- If so, the MSGin5G Configuration Function included the UE Service ID assigned to the Non-MSGin5G UE in the former configuration procedure as a part of VAL UE configuration data.
- Otherwise, a new UE Service ID is assigned to the Non-MSGin5G UE and included in the VAL UE configuration data.

Then the MSGin5G Configuration Function processes the configuration request according to the service policy.

8.1.4 MSGin5G UE bulk configuration over MSGin5G-6 reference point

When more than one MSGin5G UEs, which are constrained devices, which support an MSGin5G Client, get the MSGin5G Service configuration information via the MSGin5G Gateway UE, the MSGin5G Gateway UE may decide to use bulk configuration procedure specified in this clause based on service policy.

Pre-conditions:

1. The constrained MSGin5G UE has discovered and selected an MSGin5G Gateway UE as specified in clause 8.2.8 and connected to the serving network via the MSGin5G Gateway UE successfully.
2. The MSGin5G Gateway UE has been configured by using the procedure specified in clause 8.1.2 of the present document.

The constrained MSGin5G UE sends the Get VAL UE configuration request as specified in clause 8.1.2 of the present document to MSGin5G Gateway UE. If the MSGin5G Gateway UE decides to use bulk configuration based on the service policy, the MSGin5G Gateway UE sends a Get VAL UE configuration response including the information elements as listed in table 8.1.4-1 as a part of VAL UE configuration data to the constrained MSGin5G UEs before bulk configuration is performed. This Get VAL UE configuration response is used to inform each constrained MSGin5G UE that their Get VAL UE configuration requests will be handled later.

NOTE: How to decide that bulk configuration is used is implementation specific and out of scope.

Table 8.1.4-1: Information in the Get VAL UE configuration response to constrained device before bulk configuration is performed

Information element	Status	Description
Maximum configuration time	M	The maximum wait time for the bulk configuration request to be sent to the MSGin5G Server.

In the MSGin5G UE bulk configuration procedure, the MSGin5G Gateway UE acts as Configuration management client specified in clause 8.1.2 of the present document. In addition to the information elements listed in table 8.1.2-1 of the present document and clause 11.3.2.1 of 3GPP TS 23.434 [5], the Get VAL UE configuration request used for bulk configuration also includes the information elements as listed in table 8.1.4-2.

Table 8.1.4-2: additional Information in the Get VAL UE configuration request

Information element	Status	Description
Bulk configuration flag	M	Indicates this request is an enhanced Get VAL UE configuration request used for MSGin5G UE bulk configuration
List of MSGin5G UE IDs	M	List of MSGin5G UE ID of MSGin5G UEs which needed to be configured in this bulk configuration request

In addition to the information elements listed in table 8.1.2-2 of the present document, the Get VAL UE configuration response used for bulk configuration also includes the information elements as listed in table 8.1.4-3 as a part of VAL UE configuration data as specified in clause 11.3.2.2 of 3GPP TS 23.434 [5].

Table 8.1.4-3: additional Information in the Get VAL UE configuration response

Information element	Status	Description
List of MSGin5G UE configuration information	M	Each element in this list contains information as specified in Table 8.1.2-2. The configuration information included in this IE is used to complete the configuration of the constrained MSGin5G UEs.

Upon receiving the Get VAL UE configuration response used for bulk configuration, the MSGin5G Gateway UE includes the MSGin5G UE configuration information in the List of MSGin5G UE configuration information into multiple individual Get VAL UE configuration responses and sends them to the corresponding constrained MSGin5G UEs.

8.2 Registration

8.2.0 General

Before a UE or an Application Server can use the MSGin5G Service it needs to register with the MSGin5G Server.

The procedures of MSGin5G UE registration/de-registration are specified in clause 8.2.1 and clause 8.8.2. The procedures also apply when the MSGin5G UE uses MSGin5G services by using another UE as relay.

The procedures of Non-MSGin5G UE registration/de-registration are specified in clause 8.2.3 and clause 8.8.4.

The procedures of Application Server registration/de-registration are specified in clause 8.2.5 and clause 8.8.6.

The MSGin5G Gateway UE may use bulk registration to register more than one of MSGin5G UEs at one time if allowed by the service policy. The bulk registration procedure is specified in clause 8.2.7. Before using bulk registration, the MSGin5G UE should select a MSGin5G Gateway as specified in clause 8.2.8. If a MSGin5G Gateway UE is selected by an MSGin5G UE, the MSGin5G UE should use bulk registration over MSGin5G-6 reference point specified in clause 8.2.7 instead of the MSGin5G UE registration procedure specified in clause 8.2.1. The corresponding procedure of MSGin5G UE bulk de-registration over MSGin5G-6 reference point is specified in clause 8.2.11.

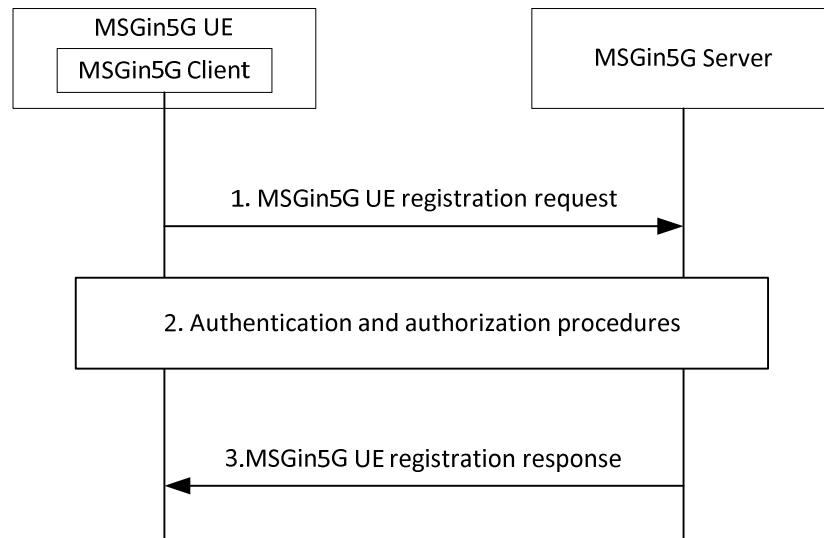
The Message Gateway may also use bulk registration/de-registration to register more than one of Non-MSGin5G UE at one time with the MSGin5G Server. The procedures of Non-MSGin5G UE bulk registration and Non-MSGin5G UE bulk de-registration are specified in clause 8.2.9 and clause 8.2.10 respectively.

8.2.1 MSGin5G UE Registration

The signalling flow for MSGin5G UE registration is illustrated in figure 8.2.1-1. The procedure assumes that the MSGin5G UE is responsible for initiating registration to the MSGin5G Server in order to establish association with the MSGin5G Server to receive MSGin5G Services.

Pre-conditions:

1. The MSGin5G UE has connected to the serving network successfully.
2. The MSGin5G UE has successfully completed the Configuration procedure; alternatively, a UE Service ID and the MSGin5G Server address have been pre-configured on the MSGin5G UE.
3. Both the MSGin5G UE and MSGin5G Server have been configured with the necessary credentials to enable authenticating one another.

**Figure 8.2.1-1: MSGin5G Client registration**

1. The MSGin5G UE sends an MSGin5G UE registration request to the MSGin5G Server. The request includes the UE Service ID and may include the MSGin5G Client Profile and Requested expiration time as detailed in Table 8.2.1-1.

Table 8.2.1-1: MSGin5G UE registration request

Information element	Status	Description
UE Service ID	M	UE service identifier assigned to the requesting MSGin5G UE.
MSGin5G Client Profile	O	Set of parameters describing the MSGin5G Client
>MSGin5G Client Triggering Information	O	UE Identifier (i.e., MSISDN, external ID), port number(s) and associated protocol (e.g., SMS, NIDD, etc.) for device triggering. See Table 8.2.1-2. The MSGin5G Server uses the information in step 5 of clause 8.9.3.2.
>MSGin5G Client Communication Availability	O	Communication availability information for the MSGin5G Client to receive MSGin5G messages. This IE informs the MSGin5G Server if the client has a specific application-level schedule/periodicity to its MSGin5G communications. See Table 8.2.1-3.
> MSGin5G Client Supported MSGin5G segment size	O	The maximum payload size of the MSGin5G message can be used by the MSGin5G Server to deliver message to this MSGin5G Client. The MSGin5G message sent to this MSGin5G Client should be segmented by the MSGin5G Server if the payload size of the message is bigger than this IE as specified in clause 8.5. The value of this IE is decided by the MSGin5G Client, and is depended on the MSGin5G Client capabilities, e.g. computing capability or application processing time limitation. If this IE is not included, the MSGin5G Server shall use the pre-configured global value (default value is 2048 bytes) within the MSGin5G service domain.
Requested expiration time	O	Requested expiration time for the registration.

Table 8.2.1-2: MSGin5G Client Triggering Information

Information element	Status	Description
MSGin5G UE ID	M	Identity of the UE hosting the MSGin5G Client (e.g., the External Identifier defined in TS 23.682 [8], or an MSISDN)
MSGin5G Client Ports	M	List of port numbers that the MSGin5G Client listens on for device triggers from the MSGin5G Server. Also included with each port number is an associated protocol (e.g., SMS, NIDD, etc.).

Table 8.2.1-3: MSGin5G Client Communication Availability

Information element	Status	Description
Scheduled communication time	M	Time when the UE becomes available for communication.
Communication duration time	M	Duration time of periodic communication.
Periodic communication indicator	O	Identifies whether the client communicates periodically or not, e.g., on demand.
Periodic communication interval	O	Interval Time of periodic communication. This IE is mandatory if the Periodic communication indicator indicates periodic communications.
Data size indication	O	Indicates the expected data size to be exchanged during the communication duration.
Store and forward option	O	Indicates opting out of store and forward services for incoming MSGin5G requests. The MSGin5G Server uses the information to determine whether Store and Forward procedure applies as specified in clause 8.3.6.

2. Upon receiving the request, the MSGin5G Server initiates authentication procedures with the MSGin5G Client and authorizes the MSGin5G Client. If the registration is successful, the MSGin5G Server stores the UE Service ID and associated MSGin5G Client Profile. The UE Service ID and associated MSGin5G Client Profile should be maintained on the MSGin5G Server until one of the following cases applies:
 - a) the MSGin5G UE de-registers from the MSGin5G Server as specified in clause 8.2.2;
 - b) the MSGin5G UE re-registered successfully with a different MSGin5G Client Profile; In this case, the MSGin5G Server shall store the UE Service ID and associated new MSGin5G Client Profile;
 - c) the MSGin5G UE registration is expired; or
 - d) the MSGin5G Server deletes the MSGin5G UE registration as required by the service provider.

NOTE: The authentication procedures in step 2 are built on top of the transport layer mechanism specified in Annex Y.2 of 3GPP TS 33.501 [16].

3. The MSGin5G Server sends an MSGin5G UE registration response to the MSGin5G UE. The response includes the information elements as detailed in Table 8.2.1-4. The registration expiration time may be returned either as provided by the MSGin5G client in the registration request or determined by the MSGin5G Server based on local policy.

Table 8.2.1-4: MSGin5G UE registration response

Information element	Status	Description
UE Service ID	M	UE service identifier of the requesting MSGin5G UE.
Registration result	M	Indication if the registration is success or failure
Registration expiration time (see NOTE 1)	O	Indicates the expiration time of the registration.
Failure Cause (see NOTE 2)	O	The reason for failure
NOTE 1: This IE shall only be present when the Registration is Success.		
NOTE 2: This IE shall only be present when the Registration result is Failure.		

8.2.2 MSGin5G UE De-Registration

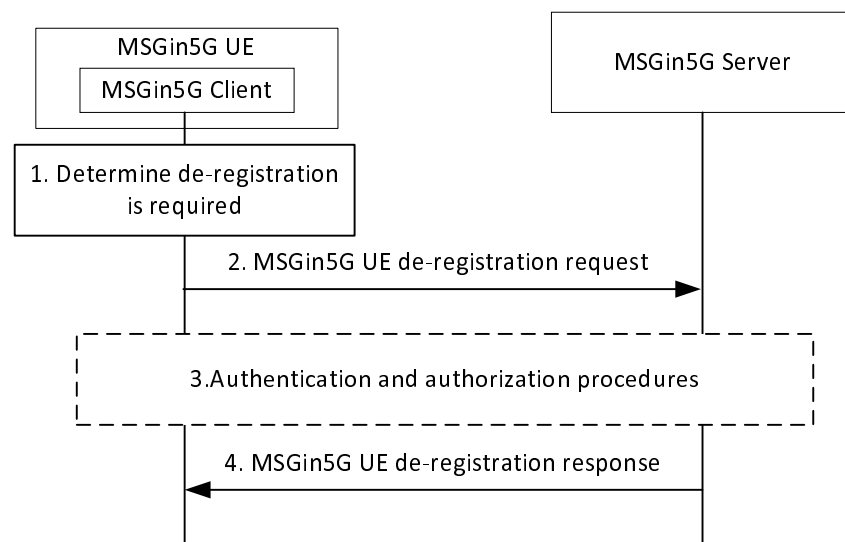
By de-registering, the MSGin5G UE informs the MSGin5G Server that it wishes to terminate its association with the MSGin5G Server.

NOTE 1: De-registration implies that Client Triggering Information and the Client Communication Availability Information are no longer valid.

The procedure assumes that the MSGin5G UE is responsible for initiating the de-registration from the MSGin5G Server. The signalling flow for MSGin5G UE de-registration is illustrated in figure 8.2.2-1.

Pre-condition:

1. The MSGin5G UE is registered to the MSGin5G Server.

**Figure 8.2.2-1: MSGin5G UE de-registration**

1. The MSGin5G UE determines to de-register from the MSGin5G Server.
2. The MSGin5G UE sends an MSGin5G UE de-registration request to the MSGin5G Server that includes the UE Service ID, as detailed in Table 8.2.2-1.

Table 8.2.2-1: MSGin5G UE de-registration request

Information element	Status	Description
UE Service ID	M	UE service identifier assigned to the MSGin5G UE.

3. The MSGin5G Server may initiate authentication procedures with the MSGin5G Client and authorizes the MSGin5G Client. If the MSGin5G Server has authorized the MSGin5G Client successfully it deletes any UE Service ID and associated MSGin5G Client Profile that it has stored.

NOTE 2: The authentication procedures in step 3 are built on top of the transport layer mechanism specified in Annex Y.2 of 3GPP TS 33.501 [16].

4. The MSGin5G Server sends an MSGin5G UE de-registration response as detailed in Table 8.2.2-2 to the MSGin5G UE.

Table 8.2.2-2: MSGin5G UE de-registration response

Information element	Status	Description
UE Service ID	M	UE service identifier of the MSGin5G UE.
De-registration result	M	Indication if the de-registration is success or failure
Failure Cause	O	The reason for failure

8.2.3 Non-MSGin5G UE Registration

Non-MSGin5G UEs (i.e., Legacy 3GPP UEs or Non-3GPP UEs) are connected to the MSGin5G Server through a Message Gateway. The Message Gateway performs registration with the MSGin5G Server on behalf of the Non MSGin5G UEs, based on pre-provisioned information when it receives a registration request from the Non MSGin5G UE, or gets the knowledge that the Non-MSGin5G UE is ready for the MSGin5G service. After the procedure is completed, the Message Gateway may communicate the result to the Non-MSGin5G UE to enable MSGin5G Services at the Non MSGin5G UE.

NOTE: The communication procedure between Non-MSGin5G UE and Message Gateway is out of scope of this document.

The signalling flow is illustrated in figure 8.2.3-1.

Pre-conditions:

1. The Message Gateway has been pre-configured with the MSGin5G Server address.
2. The Message Gateway has been configured with the necessary information as specified in clause 8.1.3. If the UE Service ID and Non-MSGin5G UE credentials have been configured and the Non-MSGin5G UE Profile is available, this pre-condition enables authentication and Non- MSGin5G UE registration at the Message Server.
3. A secured connection has been established between the Message Gateway and the MSGin5G Server.

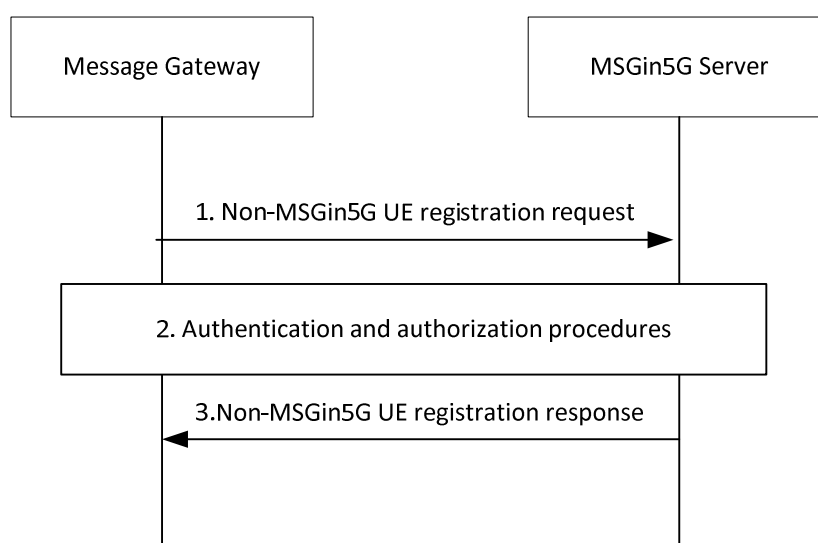


Figure 8.2.3-1: Non-MSGin5G UE registration

1. The Message Gateway sends the Non-MSGin5G UE registration request to the MSGin5G Server. The request includes the information pre-configured to the Message Gateway or provided by the Non-MSGin5G UE (e.g. in

non-MSGin5G registration or bootstrapping procedures which are out of scope of the present specification) and detailed in Table 8.2.3-1.

Table 8.2.3-1: Non-MSGin5G UE registration request

Information element	Status	Description
UE Service ID	M	UE service identifier assigned to the requesting Non-MSGin5G UE.
MGW Service ID	M	The service identifier of the Message Gateway performing registration on behalf of a Non-MSGin5G UE
Non-MSGin5G UE Profile	O	Set of parameters describing the Non-MSGin5G UE
>Non-MSGin5G UE Communication Availability	O	Communication availability information for the Non-MSGin5G UE to receive messages. This IE informs the MSGin5G Server if the Non-MSGin5G UE has a specific application-level schedule/periodicity to its MSGin5G communications, which may be used to determine whether and when MSGin5G communications are attempted. See Table 8.2.1-3.

2. Upon receiving the request, the MSGin5G Server initiates authentication procedures with the Message Gateway on behalf of the Non-MSGin5G Client and authorises the Non-MSGin5G UE to receive the MSGin5G Service. If the registration is successful, the MSGin5G Server stores the UE Service ID and associated Non-MSGin5G UE Profile. The UE Service ID and associated Non-MSGin5G UE Profile should be maintained on the MSGin5G Server until one of the following cases applies:
 - a) the Non-MSGin5G UE de-registers from the MSGin5G Server as specified in clause 8.2.4;
 - b) the Non-MSGin5G UE re-registered successfully with a different Non-MSGin5G UE Profile; In this case, the MSGin5G Server shall store the UE Service ID and associated new Non-MSGin5G UE Profile;
 - c) the Non-MSGin5G UE registration is expired; or
 - d) the MSGin5G Server deletes the Non-MSGin5G UE registration as required by the service provider.

NOTE: The authentication procedures in step 2 are built on top of the transport layer mechanism specified in Annex Y.2 of 3GPP TS 33.501 [16].

3. The MSGin5G Server returns the result of the registration in the Non-MSGin5G UE registration response message with the information detailed in table 8.2.1-4, to the Message Gateway.

8.2.4 Non-MSGin5G UE De-registration

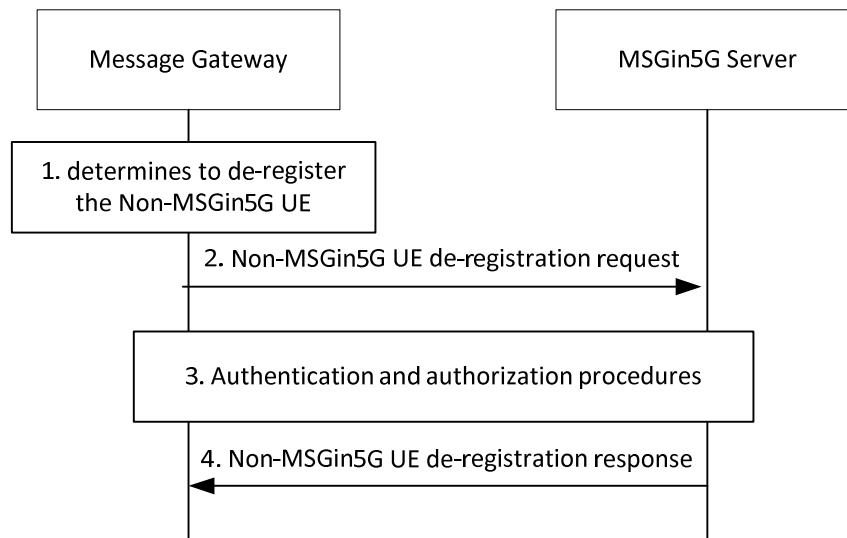
The Message Gateway performs de-registration with the MSGin5G Server on behalf of the Non-MSGin5G UEs, in order to terminate services from the MSGin5G Server.

NOTE: After the procedure is completed, the Message Gateway may communicate the result to the requesting Non-MSGin5G UE and the procedure is out of scope of this document.

The procedure assumes that the Message Gateway is responsible for initiating the de-registration from the MSGin5G Server on behalf of the Non-MSGin5G UE. The signaling flow for Non-MSGin5G UE de-registration is illustrated in figure 8.2.4-1.

Pre-condition:

1. The Message Gateway successfully performed registration with the MSGin5G Server on behalf of the Non-MSGin5G UE.

**Figure 8.2.4-1: Non-MSGin5G UE de-registration**

1. The Message Gateway determines to de-register the Non-MSGin5G UE with the MSGin5G Server.
2. The Message Gateway sends a Non-MSGin5G UE de-registration request to the MSGin5G Server that includes the UE Service ID associated with the Non-MSGin5G UE, as shown in Table 8.2.4-1.

Table 8.2.4-1: Non-MSGin5G UE de-registration request

Information element	Status	Description
UE Service ID	M	UE service identifier assigned to the Non-MSGin5G UE.

3. Upon receiving the request, the MSGin5G Server may initiate authentication procedures with the Message Gateway on behalf of the Non-MSGin5G Client and authorizes the Message Gateway. If the MSGin5G Server has authorized the Message Gateway successfully, it deletes any UE Service ID and associated Non-MSGin5G UE Profile that it has stored.

NOTE: The authentication procedures in step 3 are built on top of the transport layer mechanism specified in Annex Y.2 of 3GPP TS 33.501 [16].

4. The MSGin5G Server replies with a Non-MSGin5G UE de-registration response as shown in table 8.2.4-2.

Table 8.2.4-2: Non-MSGin5G UE De-registration response

Information element	Status	Description
UE Service ID	M	UE service identifier of the Non-MSGin5G UE.
De-registration result	M	Indication if the de-registration is success or failure
Failure Cause	O	The reason for failure

8.2.5 Application Server Registration

The signalling flow for Application Server registration is illustrated in figure 8.2.5-1. Application Server may use the procedure in this clause to do registration.

NOTE: If the Application Server does not use the Registration procedure, applicable Information Elements as listed in Table 9.1.2.3-1 need to be configured on the MSGin5G Server.

Pre-conditions:

1. The Application Server has connected to the serving network successfully.
2. An AS Service ID has been provisioned on the Application Server.

3. The MSGin5G Server address has been provisioned on the Application Server.
4. Both the Application Server and MSGin5G Server have been configured with the necessary credentials to enable authenticating one another.

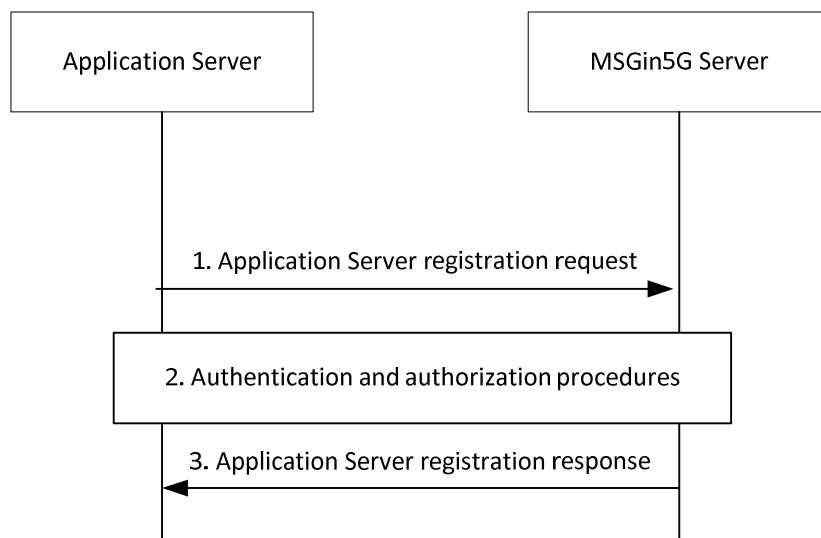


Figure 8.2.5-1: Application Server registration

1. The Application Server sends an Application Server registration request to the MSGin5G Server. The request may include authorization information for the Application Server to register to the MSGin5G Server. The request shall include the AS Service ID and may include Application Profile information and Requested expiration time as detailed in Table 9.1.2.3-1.
2. Upon receiving the request, the MSGin5G Server validates the Application Server registration request and may verify the security credentials.

NOTE: The authentication procedures in step 2 are built on top of the transport layer mechanism specified in Annex Y.4 of 3GPP TS 33.501 [16].

3. The MSGin5G Server sends an Application Server registration response to the Application Server. The response includes the information elements as specified in Table 9.1.2.4-1. If the registration is successful, the MSGin5G Server stores the AS Profile information as detailed in Table 9.1.2.3-1. The Application Profile should be maintained on the MSGin5G Server until one of the following cases applies:
 - a) the Application Server de-registers from the MSGin5G Server as specified in clause 8.2.6;
 - b) the Application Server re-registered successfully with a different Application Profile; In this case, the MSGin5G Server shall store the AS Service ID and associated new Application Profile;
 - c) the Application Server registration is expired; or
 - d) the MSGin5G Server deletes the Application Server registration as required by the service provider.

8.2.6 Application Server De-registration

By de-registering, the Application Server informs the MSGin5G Server that it wishes to terminate its association with the MSGin5G Server.

The procedure assumes that the Application Server is responsible for triggering the de-registration from the MSGin5G Server. The signalling flow for Application Server de-registration is illustrated in figure 8.2.6-1.

Pre-conditions:

1. The Application Server is registered to the MSGin5G Server.

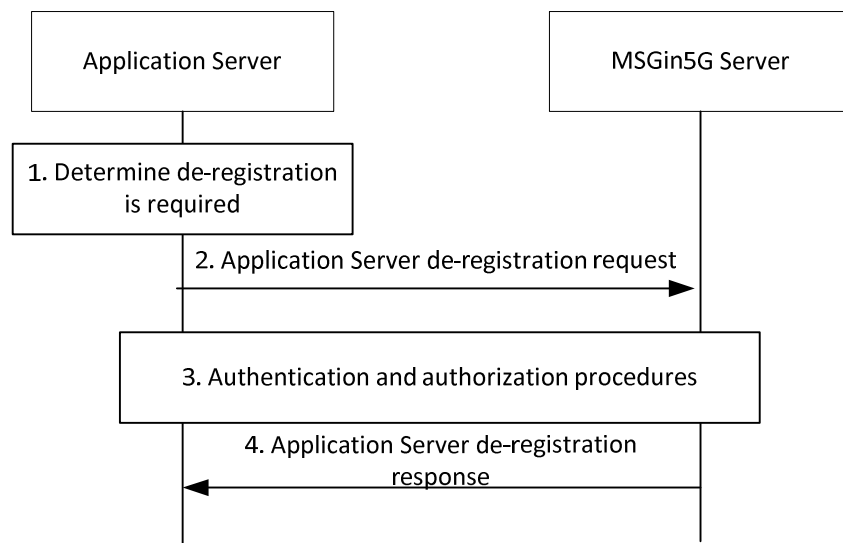


Figure 8.2.6-1: Application Server de-registration

1. The Application Server determines to de-register from the MSGin5G Server.
2. The Application Server sends an Application Server de-registration request to the MSGin5G Server that includes the AS Service ID, as detailed in Table 9.1.2.5-1.
3. The MSGin5G Server validates the Application Server de-registration request. If the MSGin5G Server has authorized the Application Server successfully, it deletes any AS Profile information that it has stored.

NOTE: The authentication procedures in step 3 are built on top of the transport layer mechanism specified in Annex Y.4 of 3GPP TS 33.501 [16].

4. The MSGin5G Server replies with an Application Server de-registration response as detailed in Table 9.1.2.6-1.

8.2.7 MSGin5G UE bulk registration over MSGin5G-6 reference point

When MSGin5G UE-1 and UE-2, which support an MSGin5G Client, perform registration via MSGin5G Gateway UE to contact the MSGin5G Server, the MSGin5G Gateway service functionality in the MSGin5G Gateway UE may decide to use bulk registration procedure specified in this clause based on the registration request sent from MSGin5G Clients in MSGin5G UE-1 and MSGin5G UE-2, if allowed by service policy. The procedure for MSGin5G UE bulk registration is illustrated in figure 8.2.7-1.

Pre-conditions:

1. The MSGin5G Gateway UE has registered to the MSGin5G Server successfully.
2. MSGin5G UE-1 and MSGin5G UE-2 have discovered and selected an MSGin5G Gateway UE as specified in clause 8.2.8 and connected to the serving network via MSGin5G Gateway UE successfully.
3. UE Service IDs and the MSGin5G Server addresses have been configured on the MSGin5G Gateway UE, MSGin5G UE-1 and MSGin5G UE-2. All these MSGin5G UEs are served by a same MSGin5G Server.
4. Both the MSGin5G UEs and MSGin5G Server have been configured with the necessary credentials to enable authenticating one another.

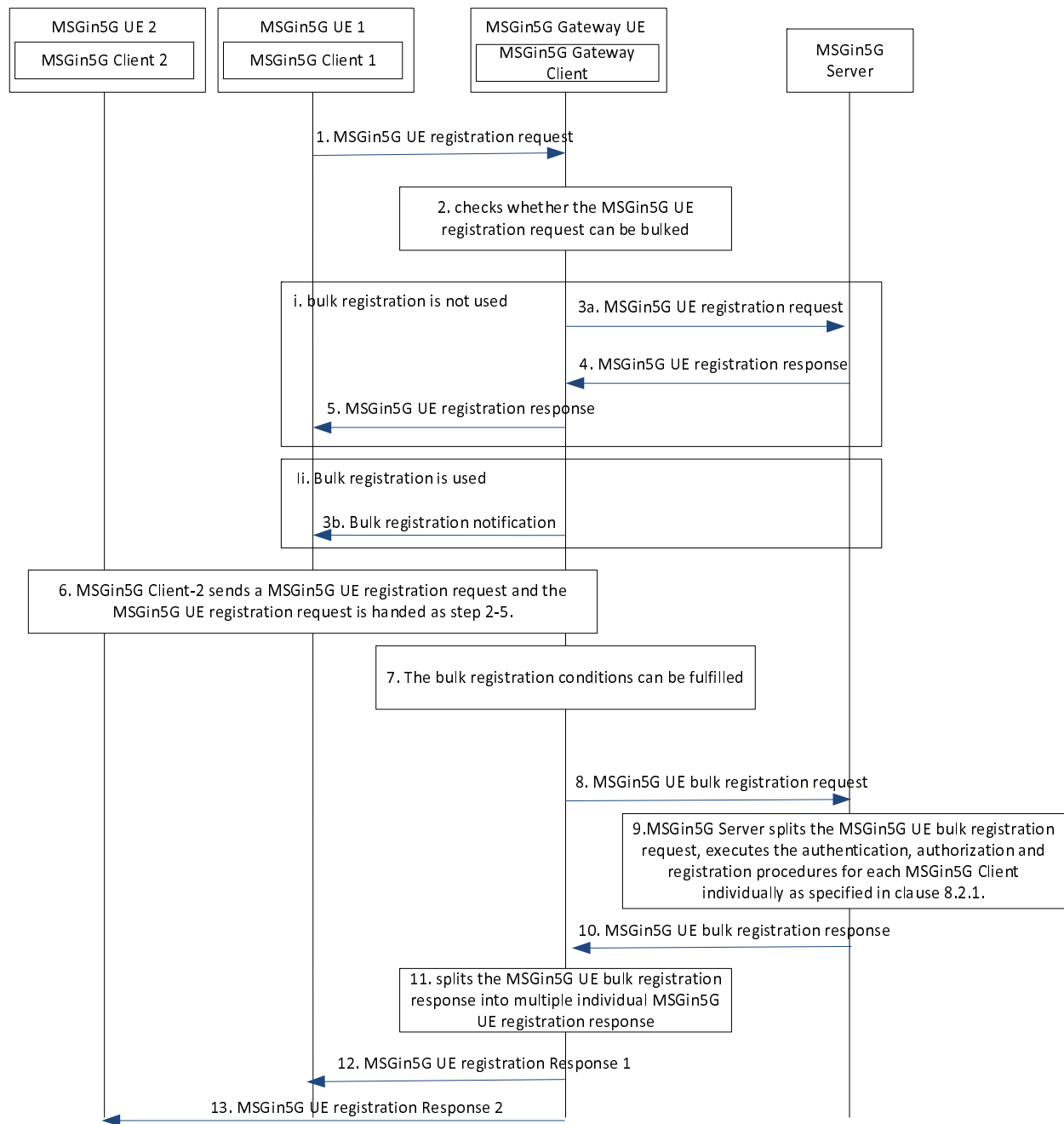


Figure 8.2.7-1: MSGin5G Client bulk registration

1. The MSGin5G Client-1 sends an MSGin5G UE registration request to the MSGin5G Server as specified in clause 8.2.1, In addition to the Information Elements specified in table 8.2.1-1, the MSGin5G Client-1 may also add the Information Elements specified in table 8.2.7-1 in the MSGin5G UE registration request.

Table 8.2.7-1: MSGin5G UE registration request

Information element	Status	Description
Registration urgent degree	O	Indicates whether the registration request is urgent or not.
Wait time	O	Indicates the maximum wait time of the registration request allowed by the MSGin5G Client which sent the registration request before the bulk registration request is sent to the MSGin5G Server.

2. Upon receiving the MSGin5G UE registration request, the MSGin5G Gateway Client checks whether this request can be queued for bulk-handling based on the service policy and the information included in the MSGin5G UE registration request, e.g. whether the MSGin5G UE registration request is urgent.

NOTE 1: Whether bulk registration is supported can be configured in the MSGin5G Gateway Client.

NOTE 2: The bulk registration conditions are specified by the application provider or MSGin5G Service provider and are out of scope of this document.

3. Based on step 2:
- a) if the MSGin5G UE registration request is urgent, MSGin5G Gateway Client may also include other registration requests; or
 - b) if the MSGin5G UE registration request can be bulk-handled, MSGin5G Gateway Client sends a bulk registration notification to MSGin5G Client-1 and caches/stores the MSGin5G UE registration request until the bulk registration conditions can be fulfilled. The Information Elements specified in table 8.2.7-2 are included in the bulk registration notification. The steps 4 and 5 are skipped.

Table 8.2.7-2: bulk registration notification

Information element	Status	Description
UE Service ID	M	UE service identifier assigned to the requesting MSGin5G UE.
Expected registration time	O	The expected time when the bulk registration can be handled and the MSGin5G UE registration Response can be received.

4. The MSGin5G Server handles the MSGin5G UE registration request as specified in clause 8.2.1 and sends the corresponding MSGin5G UE registration response to MSGin5G Gateway Client.
5. The MSGin5G Gateway Client sends the MSGin5G UE registration response to MSGin5G Client-1. The MSGin5G Client-1 handles the MSGin5G UE registration response as specified in clause 8.2.1 and skips all the remaining steps in the present clause.
6. MSGin5G Client-2 sends an MSGin5G UE registration request and the MSGin5G UE registration request is handed as in steps 2-5.
7. The MSGin5G Gateway Client finds that the conditions of sending a bulk registration request can be fulfilled, e.g.
- a) the registration request expiration time in the MSGin5G UE registration request sent from MSGin5G Client-1 or MSGin5G Client-2 is reached; or
 - b) the periodic bulk registration interval is reached; or
 - c) the maximum MSGin5G UE registration request number in a MSGin5G UE bulk registration request is reached.

NOTE 3: The maximum registration time, periodic bulk registration interval and maximum MSGin5G UE registration request number are implementation specific and out of the scope of the current specification.

8. The MSGin5G Gateway Client includes all cached/stored MSGin5G UE registration requests in an MSGin5G UE bulk registration request and sends it to the MSGin5G Server. The Information Elements specified in table 8.2.7-3 are included in the MSGin5G UE bulk registration request.

Table 8.2.7-3: MSGin5G UE bulk registration request

Information element	Status	Description
Number of individual MSGin5G UE registration requests	M	Indicates total number of MSGin5G UE registration requests which are bulked in this MSGin5G UE bulk registration request
List of individual MSGin5G UE registration request	M	Each element in this list contains information as specified in Table 8.2.1-1.

9. Upon receiving the MSGin5G UE bulk registration request, the MSGin5G Server splits the MSGin5G UE bulk registration request, executes the authentication, authorization and registration procedures for each MSGin5G Client individually as specified in clause 8.2.1.

NOTE 4: Security aspects of bulk registration is implementation specific in this release.

10. The MSGin5G Server includes all corresponding MSGin5G UE registration responses in an MSGin5G UE bulk registration response and sends it to MSGin5G Gateway Client. The Information Elements specified in table 8.2.7-4 are included in the MSGin5G UE bulk registration response.

Table 8.2.7-4: MSGin5G UE bulk registration response

Information element	Status	Description
Number of individual MSGin5G UE registration responses	M	Indicates total number of MSGin5G UE registration responses which are bulked in this MSGin5G UE bulk registration response
List of individual MSGin5G UE registration response	M	Each element in this list contains information as specified in Table 8.2.1-4.

11. Upon receiving the MSGin5G UE bulk registration response, the MSGin5G Gateway Client splits the MSGin5G UE bulk registration response into multiple individual MSGin5G UE registration responses. Each individual MSGin5G UE registration response contains information as specified in Table 8.2.1-4.
12. MSGin5G Gateway Client sends the MSGin5G UE registration Response 1 to MSGin5G Client-1.
13. MSGin5G Gateway Client sends the MSGin5G UE registration Response 2 to MSGin5G Client-2.

8.2.8 Constrained device with MSGin5G Client selecting MSGin5G Gateway UE

The signalling flow for MSGin5G Client-2 in the MSGin5G UE-2 (which is a constrained device) to request other MSGin5G UEs supporting MSGin5G Gateway service functionality to provide their configuration is illustrated in figure 8.2.8-1.

Pre-conditions:

- 1) MSGin5G UE-2 is not able to communicate with MSGin5G Server directly;
- 2) MSGin5G UE-2 has discovered nearby MSGin5G UEs using ProSe direct discovery procedure as specified in 3GPP TS 23.304 [18] and the 5G ProSe Direct Communication is established between MSGin5G UE-2 and nearby MSGin5G UE-1 and MSGin5G UE-3 as specified in 3GPP TS 23.304 [18].
- 3) An MSGin5G UE-3 supports MSGin5G Gateway service functionality (i.e. MSGin5G UE-3 is an MSGin5G Gateway UE) and an MSGin5G UE-1 does not support MSGin5G Gateway service functionality (i.e. MSGin5G UE-1 is not an MSGin5G Gateway UE).
- 4) The UE service ID has been pre-configured on the MSGin5G UE-2.

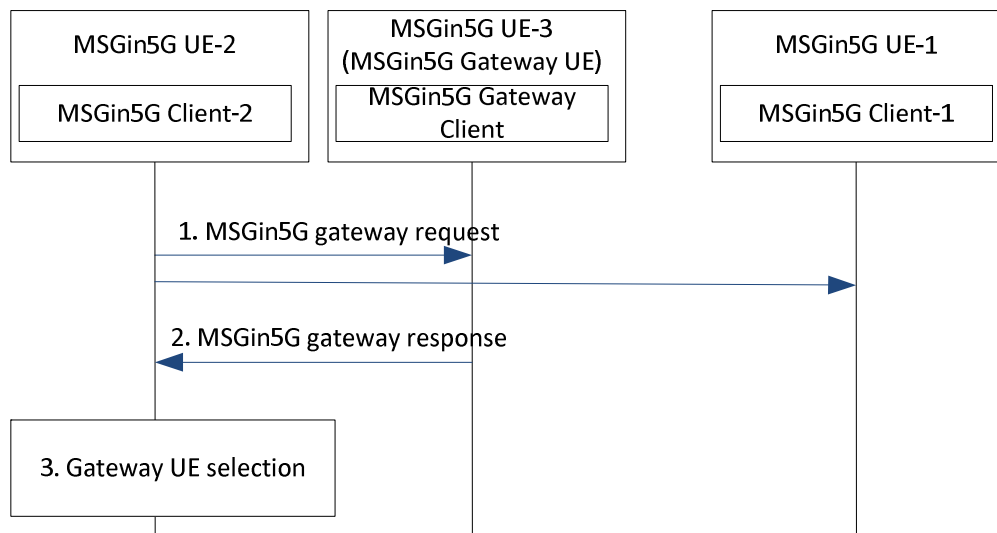


Figure 8.2.8-1: Constrained UE sending message to request configuration of the MSGin5G Gateway UE

- 1) The MSGin5G Client-2 in MSGin5G UE-2 (which is a constrained UE) sends messages to all surrounding MSGin5G UEs (using ProSe Direction communication as specified in 3GPP TS 23.304 [18]) to provide their gateway configuration if MSGin5G Gateway service functionality is supported by the MSGin5G UE, i.e. the MSGin5G UE is a MSGin5G Gateway UE. The request message includes information elements as specified in Table 8.2.8-1.

Table 8.2.8-1: Information elements for Request for gateway UE configuration

Information element	Status	Description
Layer-2 ID	M	Layer-2 identity of UE-2
UE service ID	M	UE service identifier of the UE-2
MSGin5G UE ID	O	MSGin5G device identifier of the UE-2
Required packet size	M	Maximum allowed packet size of the UE-2

- 2) Upon receiving the request from the MSGin5G Client of MSGin5G UE-2, the MSGin5G UE-3 supporting the MSGin5G Gateway service functionality sends the response for the gateway configuration. The response message includes information elements as specified in Table 8.2.8-2. The MSGin5G UE-1 does not support the MSGin5G Gateway service functionality and ignores the request for gateway UE configuration, i.e. should not send a corresponding response.

Table 8.2.8-2: Information elements for Response for gateway UE configuration

Information element	Status	Description
Layer-2 ID	M	Layer-2 identity of UE-1
UE service ID	M	UE service identifier of the UE-1
MSGin5G UE ID	O	MSGin5G device identifier of the UE-1
Allowed packet size	M	Maximum allowed packet size of the UE-2

- 3) If the MSGin5G UE-2 receives responses from multiple different MSGin5G Gateway UEs, then the MSGin5G Client of the MSGin5G UE-2 selects an MSGin5G Gateway UE whose value of the Allowed packet size is equal or more than the value of the Required packet size of the MSGin5G UE-2. If the value of the Allowed packet size is less than the value of the Required packet size for all MSGin5G Gateway UE, then the MSGin5G Client of the MSGin5G UE-2 selects the MSGin5G Gateway UE with the maximum value of the Allowed packet size among all MSGin5G Gateway UEs and further sets the maximum allowed packet size of the constrained UE to the value of the Allowed packet size of the selected MSGin5G Gateway UE.

If the MSGin5G UE-2 receives responses from multiple MSGin5G Gateway UEs which serve different domains, the MSGin5G UE-2 shall select the MSGin5G Gateway UE that serves the same domain as the MSGin5G UE-2 does, based on the UE service ID.

Once MSGin5G UE has selected the MSGin5G Gateway UE, the MSGin5G UE indicates the selected MSGin5G Gateway UE by registering to use the gateway service. The signalling flow for MSGin5G Client in the MSGin5G UE (which is a constrained device) to register itself to use Gateway service of the MSGin5G Gateway UE is illustrated in figure 8.2.8-2.

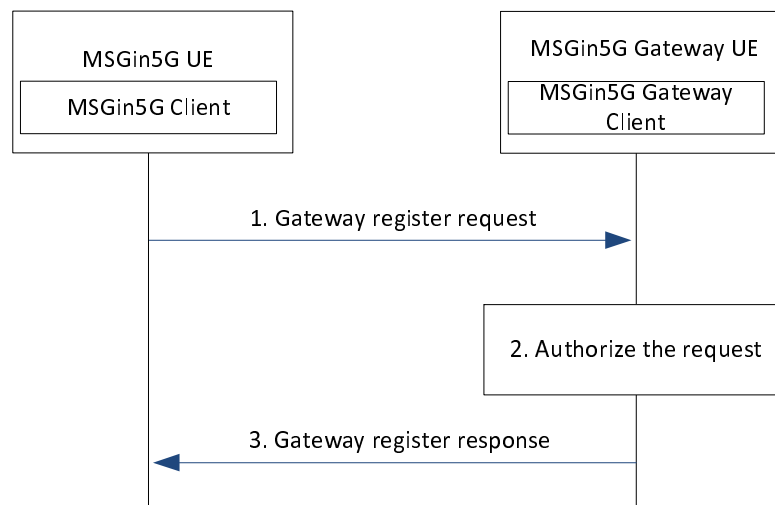


Figure 8.2.8-2: Constrained UE registering to use MSGin5G Gateway UE

- 1) Upon selecting the MSGin5G Gateway UE, the MSGin5G Client of the MSGin5G UE sends a Gateway registration request to register with the selected MSGin5G Gateway UE to request the use of gateway service. The request message includes the UE service ID and may include the MSGin5G UE ID of the MSGin5G UE (i.e. constrained UE) and the time till when constrained device is intended to use the gateway service from the selected MSGin5G Gateway UE. The information elements are specified in Table 8.2.8-3.

Table 8.2.8-3: Information elements for Gateway registration request

Information element	Status	Description
UE service ID	M	UE service identifier of the MSGin5G UE
MSGin5G UE ID	O	Unique identifier that represents the MSGin5G UE (i.e. the device identifier of the MSGin5G UE)
Time till	O	The time when constrained device is intended to use the gateway service

- 2) Upon receiving the request from the MSGin5G Client of the MSGin5G UE, the MSGin5G Gateway Client in MSGin5G Gateway UE checks whether the MSGin5G UE is authorized to use the gateway service or not.
- 3) The MSGin5G Gateway Client in MSGin5G Gateway UE sends the response message with the status of the registration. If the registration is successful, the response message includes parameters like the Accepted time till when the constrained device is allowed to use the gateway service from the selected MSGin5G Gateway UE. The information elements are specified in Table 8.2.8-4.

Table 8.2.8-4: Gateway registration response

Information element	Status	Description
UE Service ID	M	UE service identifier of the requesting MSGin5G UE.
Registration result	M	Indication if the registration is success or failure
Accepted time till	O	Indicates the time when constrained device is allowed to use the gateway service if the constrained device was authorized successfully.
Failure Cause	O	The reason for failure. This IE should be included if the Registration result is failure.

8.2.9 Non-MSGin5G UE bulk registration

Non-MSGin5G UEs (i.e., Legacy 3GPP UEs or Non-3GPP UEs) are connected to the MSGin5G Server through a Message Gateway. The Message Gateway may decide to use bulk registration procedure specified in this clause based on service policy. The procedure for Non-MSGin5G UE bulk registration is illustrated in figure 8.2.9-1.

Pre-conditions:

1. The Message Gateway has been pre-configured with the MSGin5G Server address.
2. The Message Gateway has been configured with the necessary information as specified in clause 8.1.3. If the UE Service ID and Non-MSGin5G UE credentials have been configured and the Non-MSGin5G UEs' Profile is available, this pre-condition enables authentication and Non-MSGin5G UEs registration at the Message Server.
3. A secured connection has been established between the Message Gateway and the MSGin5G Server.

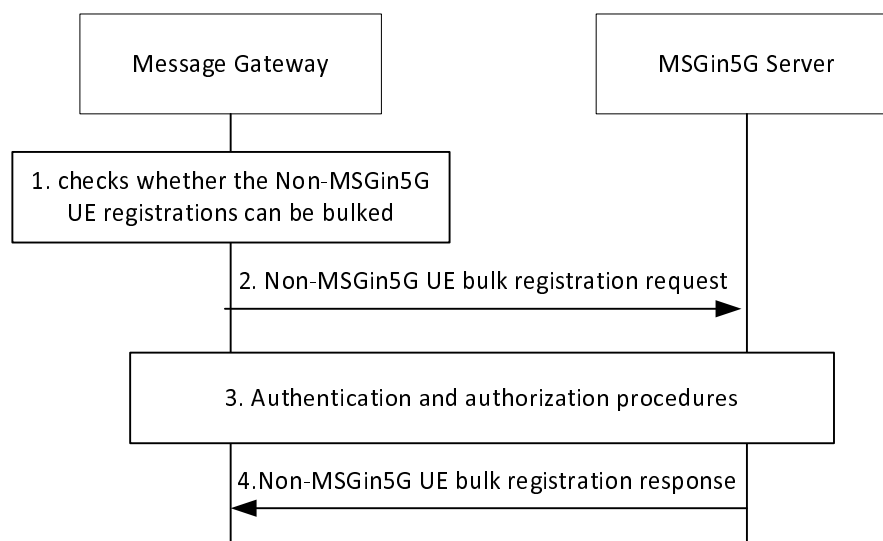


Figure 8.2.9-1: Non-MSGin5G UE bulk registration

1. The Message Gateway determines to perform Non-MSGin5G UE bulk registration.

NOTE 1: The conditions of whether the Non-MSGin5G UE bulk registration is used are implementation specific and out of the scope of the current specification.

2. The Message Gateway sends a Non-MSGin5G UE bulk registration request to the MSGin5G Server. The Information Elements specified in table 8.2.9-1 are included in the Non-MSGin5G UE bulk registration request.

Table 8.2.9-1: Non-MSGin5G UE bulk registration request

Information element	Status	Description
Number of individual MSGin5G UE registration requests	M	Indicates total number of Non-MSGin5G UE registration requests which are bulked in this Non-MSGin5G UE bulk registration request
List of individual Non-MSGin5G UE information	M	Each element in this list contains information as specified in Table 8.2.3-1.

3. Upon receiving the Non-MSGin5G UE bulk registration request, the MSGin5G Server processes each of the UE registrations from the list individually as specified in clause 8.2.3. For each individual Non-MSGin5G UE registration that successful, the MSGin5G Server stores that UE Service ID and associated Non-MSGin5G UE Profile information.

NOTE 2: Security aspects of bulk registration is implementation specific in this release.

4. The MSGin5G Server includes all corresponding MSGin5G UE registration responses in a Non-MSGin5G UE bulk registration response and sends it to the Message Gateway. The Information Elements specified in table 8.2.9-2 are included in the Non-MSGin5G UE bulk registration response.

Table 8.2.9-2: MSGin5G UE bulk registration response

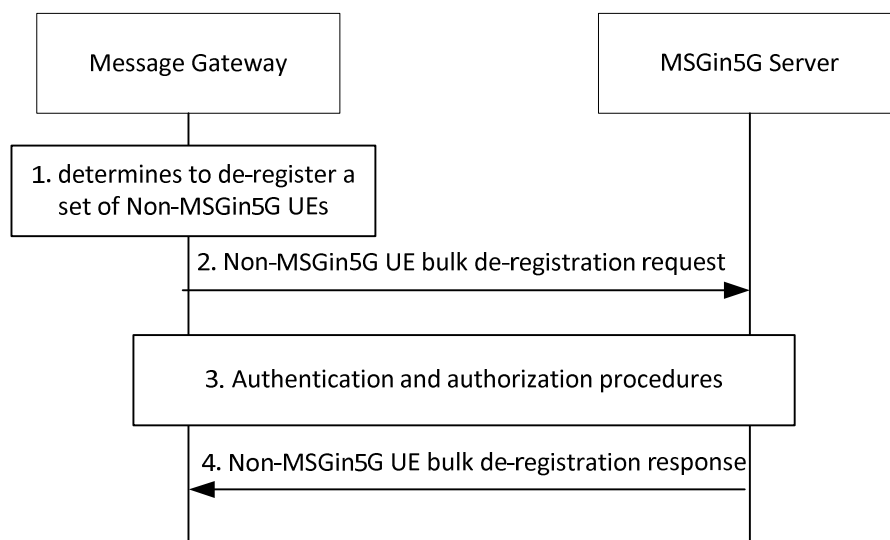
Information element	Status	Description
Number of individual Non-MSGin5G UE registration responses	M	Indicates total number of Non-MSGin5G UE registration responses which are bulked in this MSGin5G UE bulk registration response
List of individual Non-MSGin5G UE registration response	M	Each element in this list contains information as specified in Table 8.2.1-4.

8.2.10 Non-MSGin5G UE bulk de-registration

The procedure assumes that the Message Gateway is responsible for initiating the bulk de-registration from the MSGin5G Server on behalf of the Non-MSGin5G UEs. The signaling flow for Non-MSGin5G UE bulk de-registration is illustrated in figure 8.2.10-1.

Pre-conditions:

1. The Message Gateway successfully performed registration with the MSGin5G Server on behalf of a set of Non-MSGin5G UEs.

**Figure 8.2.10-1: Non-MSGin5G UE bulk de-registration**

1. The Message Gateway determines to perform Non-MSGin5G UE bulk de-registration.

NOTE 1: The conditions of whether the Non-MSGin5G UEs can be bulked de-registered are implementation specific and out of the scope of the current specification.

2. The Message Gateway sends a Non-MSGin5G UE bulk de-registration request to the MSGin5G Server. The Information Elements specified in table 8.2.10-1 are included in the Non-MSGin5G UE bulk de-registration request.

Table 8.2.10-1: Non-MSGin5G UE bulk de-registration request

Information element	Status	Description
Number of individual MSGin5G UE de-registration requests	M	Indicates total number of Non-MSGin5G UE de-registration requests which are bulked in this Non-MSGin5G UE bulk de-registration request
List of individual UE Service ID	M	Each element in this list contains a UE service identifier assigned to the Non-MSGin5G UE.

3. Upon receiving the request, the MSGin5G Server processes each of the UE de-registration from the list individually as specified in clause 8.2.4. The MSGin5G Server deletes any applicable UE Service ID in the List of individual UE Service ID and associated MSGin5G Client Profile information that it has stored.

NOTE 2: Security aspects of bulk registration is implementation specific in this release.

4. The MSGin5G Server replies with a Non-MSGin5G UE bulk de-registration response as shown in table 8.2.10-2.

Table 8.2.10-2: Non-MSGin5G UE bulk de-registration response

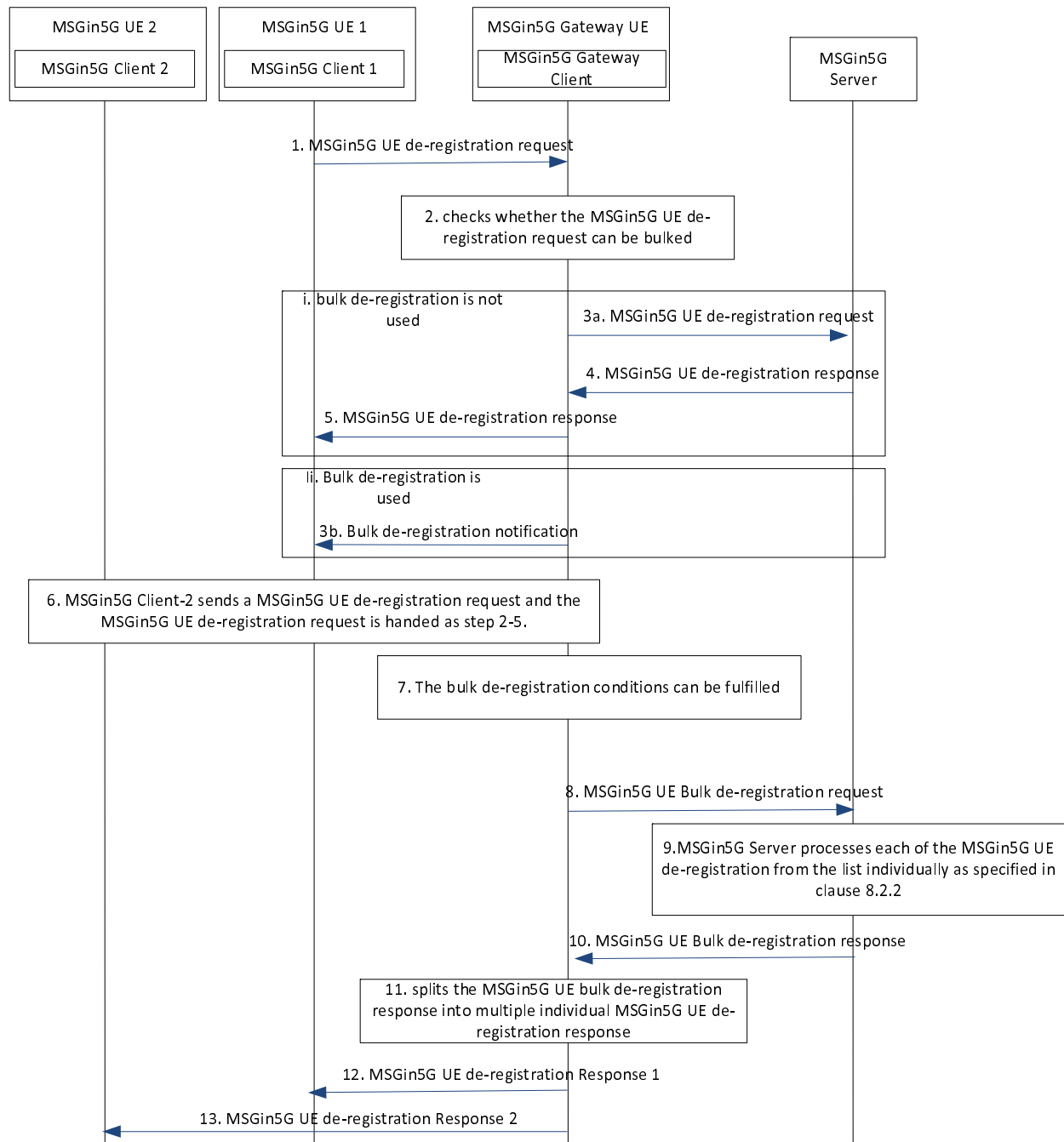
Information element	Status	Description
Number of individual Non-MSGin5G UE de-registration responses	M	Indicates total number of Non-MSGin5G UE de-registration responses which are bulked in this Non-MSGin5G UE bulk de-registration response
List of individual Non-MSGin5G UE de-registration response	M	Each element in this list contains information as specified in Table 8.2.4-2.

8.2.11 MSGin5G UE bulk de-registration over MSGin5G-6 reference point

The MSGin5G Gateway UE may decide to use bulk de-registration procedure specified in this clause based on the de-registration request sent from MSGin5G Clients in MSGin5G UEs or, if allowed by service policy. The procedure for MSGin5G UE bulk de-registration is illustrated in figure 8.2.11-1.

Pre-conditions:

1. The MSGin5G Gateway UE has registered to the MSGin5G Server successfully.
2. MSGin5G UE-1 and MSGin5G UE-2 have registered to the MSGin5G Server via MSGin5G Gateway UE successfully as specified in clause 8.2.8.

**Figure 8.2.11-1: MSGin5G UE bulk de-registration**

1. The MSGin5G Client-1 sends an MSGin5G UE de-registration request to the MSGin5G Server as specified in clause 8.2.2, In addition to the Information Elements specified in table 8.2.2-1, the MSGin5G Client-1 may also add the Information Elements specified in table 8.2.11-1 in the MSGin5G UE de-registration request.

Table 8.2.11-1: MSGin5G UE de-registration request

Information element	Status	Description
De-registration urgent degree	O	Indicates whether the de-registration request is urgent or not.
Wait time	O	Indicates the maximum wait time of the de-registration request allowed by the MSGin5G Client-2 before the bulk de-registration request is sent to the MSGin5G Server.

2. Upon receiving the MSGin5G UE de-registration request, the MSGin5G Gateway Client checks whether this request can be queued for bulk-handling based on the service policy and the information included in the MSGin5G UE registration request, e.g. whether the MSGin5G UE de-registration request is urgent.

NOTE 1: Whether bulk de-registration is supported can be configured in the MSGin5G Gateway Client.

NOTE 2: The bulk de-registration conditions are specified by the application provider or MSGin5G Service provider and are out of scope of this document.

3. Based on step 2:
 - a) if the MSGin5G UE de-registration request is urgent, the MSGin5G Gateway Client may also include other registration requests; or
 - b) if the MSGin5G UE de-registration request can be bulked, MSGin5G Client-1 sends a bulk de-registration notification to MSGin5G Client-1 and caches/stores the MSGin5G UE de-registration request until the bulk de-registration conditions can be fulfilled. The Information Elements specified in table 8.2.11-2 are included in the bulk de-registration notification. The steps 4 and 5 are skipped.

Table 8.2.11-2: bulk de-registration notification

Information element	Status	Description
UE Service ID	M	UE service identifier assigned to the requesting MSGin5G UE.
Expected de-registration time	O	The expected time when the bulk de-registration can be handled and the MSGin5G UE de-registration response can be received.

4. The MSGin5G Server handles the MSGin5G UE de-registration request as specified in clause 8.2.2 and sends the corresponding MSGin5G UE de-registration response to MSGin5G Gateway Client.
5. The MSGin5G Gateway Client sends the MSGin5G UE de-registration response to MSGin5G Client-1. The MSGin5G Client-1 handles the MSGin5G UE de-registration response as specified in clause 8.2.2 and skips all the remaining steps in the present clause.
6. MSGin5G Client-2 sends an MSGin5G UE de-registration request and the MSGin5G UE de-registration request is handled as in steps 2-5.
7. The MSGin5G Gateway Client finds that the conditions of sending a bulk de-registration request can be fulfilled, e.g.
 - a) the de-registration request expiration time in the MSGin5G UE de-registration request sent from MSGin5G Client-1 or MSGin5G Client-2 is reached; or
 - b) the periodic bulk de-registration interval is reached; or
 - c) the maximum MSGin5G UE de-registration request number in a MSGin5G UE bulk de-registration request is reached.

NOTE 3: The maximum de-registration time, periodic bulk de-registration interval and maximum MSGin5G UE de-registration request number are implementation specific and out of the scope of the current specification.

8. The MSGin5G Gateway Client includes all cached/stored MSGin5G UE de-registration requests in an MSGin5G UE bulk de-registration request and sends it to the MSGin5G Server. The Information Elements specified in table 8.2.11-3 are included in the MSGin5G UE bulk de-registration request.

Table 8.2.11-3: MSGin5G UE bulk de-registration request

Information element	Status	Description
Number of individual MSGin5G UE de-registration requests	M	Indicates total number of MSGin5G UE de-registration requests which are bulked in this MSGin5G UE bulk de-registration request
List of individual MSGin5G UE de-registration request	M	Each element in this list contains information as specified in Table 8.2.2-1.

9. Upon receiving the MSGin5G UE bulk de-registration request, the MSGin5G Server processes each of the MSGin5G UE de-registration from the list individually as specified in clause 8.2.2.

NOTE 4: Security aspects of bulk registration is implementation specific in this release.

10. The MSGin5G Server includes all corresponding MSGin5G UE de-registration responses in an MSGin5G UE bulk de-registration response and sends it to MSGin5G Gateway Client. The Information Elements specified in table 8.2.11-4 are included in the MSGin5G UE bulk de-registration response.

Table 8.2.11-4: MSGin5G UE bulk de-registration response

Information element	Status	Description
Number of individual MSGin5G UE de-registration responses	M	Indicates total number of MSGin5G UE de-registration responses which are bulked in this MSGin5G UE bulk de-registration response
List of individual MSGin5G UE de-registration response	M	Each element in this list contains information as specified in Table 8.2.2-2

11. Upon receiving the MSGin5G UE bulk de-registration response, the MSGin5G Gateway Client splits the MSGin5G UE bulk de-registration response into multiple individual MSGin5G UE de-registration responses. Each individual MSGin5G UE de-registration response contains information as specified in Table 8.2.2-2.
12. MSGin5G Gateway Client sends the MSGin5G UE de-registration Response 1 to MSGin5G Client-1.
13. MSGin5G Gateway Client sends the MSGin5G UE de-registration Response 2 to MSGin5G Client-2.

8.3 Message delivery procedures

8.3.1 General

All MSGin5G message traffic is routed via the MSGin5G Server. The present clause specifies the MSGin5G message origination procedure when a MSGin5G service endpoint (i.e. MSGin5G UE, AS or Message Gateway) sending a message to its recipient(s) and the MSGin5G message termination procedure when a MSGin5G Server delivers a message to the MSGin5G service endpoint.

8.3.2 MSGin5G messages origination procedure

Figure 8.3.2-1 shows the procedure for an MSGin5G UE that initiates an MSGin5G message request.

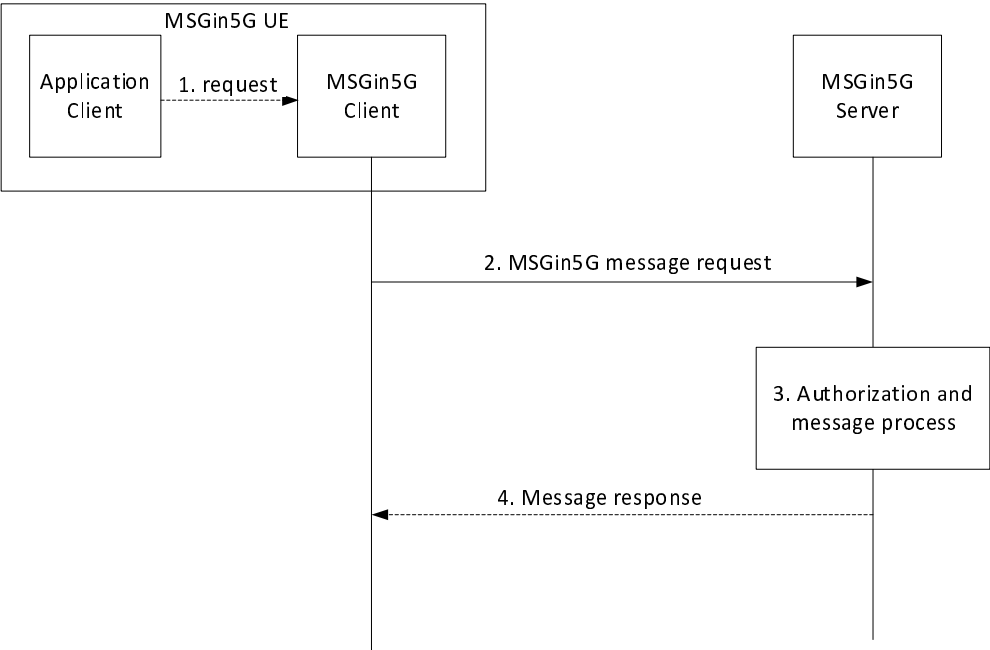


Figure 8.3.2-1: New MSGin5G message request from UE

Figure 8.3.2-2 shows the procedure for an Application Server that initiates an API request specified in clause 9.1.1.1 for sending an MSGin5G message to UE.

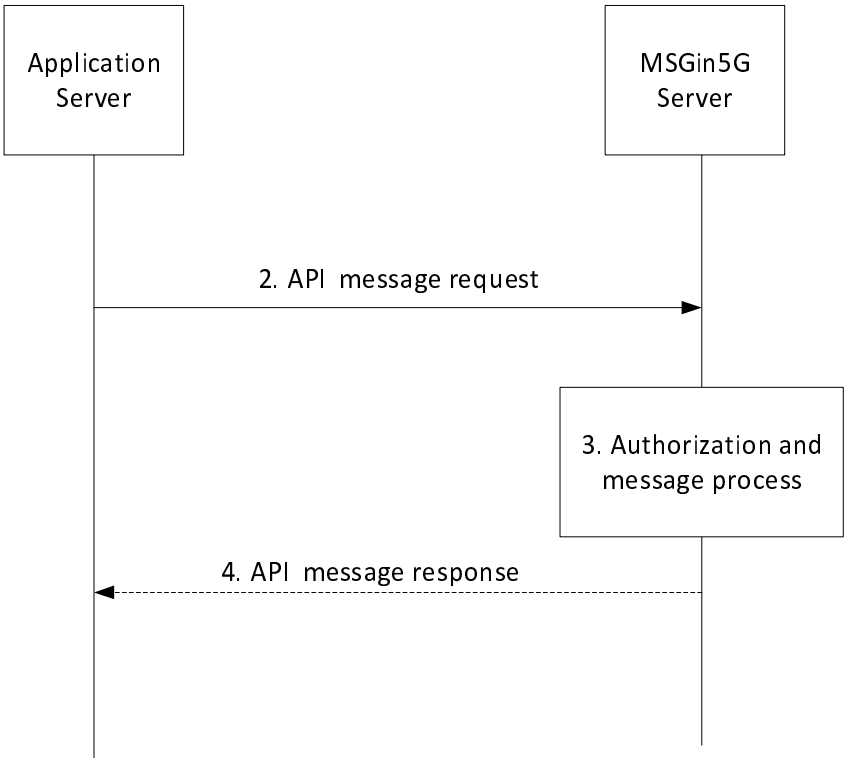


Figure 8.3.2-2: Application Server initiates a request for sending an MSGin5G message

Figure 8.3.2-3 shows the procedure for a Legacy 3GPP Message Gateway or a non-3GPP Message Gateway that sends a new MSGin5G message request to the MSGin5G Server on behalf of a Legacy 3GPP UE or Non-3GPP UE.

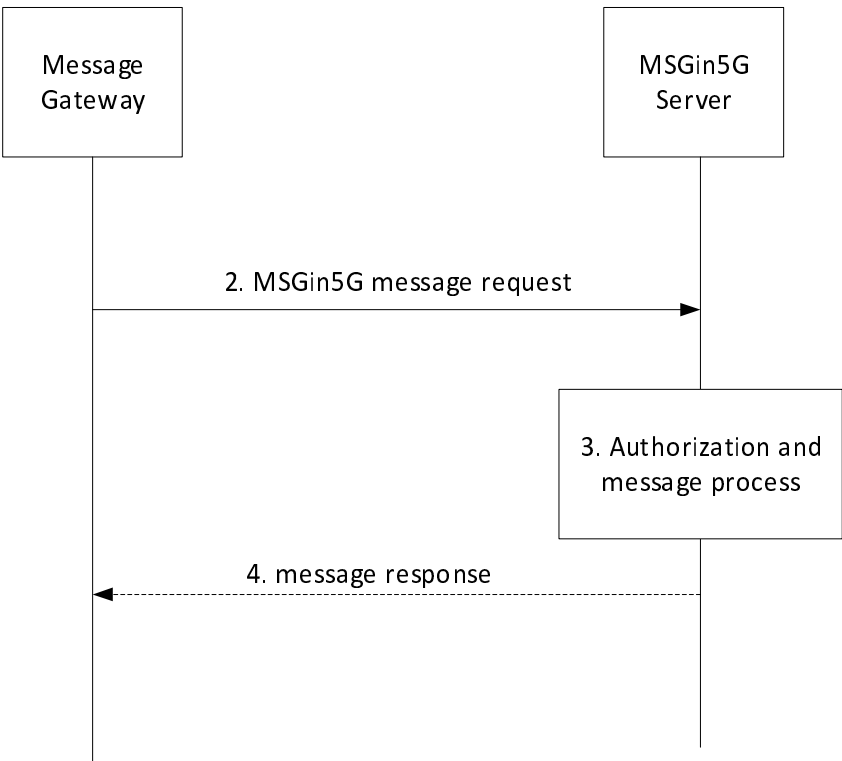


Figure 8.3.2-3: New MSGin5G message request sending from Message Gateway

The following procedure applies to the above figures 8.3.2-1, 8.3.2-2 and 8.3.2-3 with the exception that step 1 only applies to figure 8.3.2-1.

1. The Application Client in the UE sends a request to the MSGin5G Client for invoking the MSGin5G Client to send a new MSGin5G message to a recipient or to multiple recipients.

NOTE 1: The APIs provided by the MSGin5G Client to the Application Client are implementation specific in this release.

2. As shown in figure 8.3.2-1 or 8.3.2-3, the MSGin5G Client or Message Gateway sends the MSGin5G message request to the MSGin5G Server and includes the IEs as listed in table 8.3.2-1 in the request; or as shown in figure 8.3.2-2, the Application Server sends an API request to the MSGin5G Server for sending an MSGin5G message, the API request includes the IEs as listed in table 8.3.2-1.

NOTE 2: If the value of the Store and forward flag IE in the MSGin5G message request indicates that store and forward services are requested by the sender, the procedure in 8.3.6 applies instead.

Table 8.3.2-1: Request to MSGin5G Server for sending MSGin5G message

Information element	Status	Description
Originating UE Service ID/AS Service ID	M	The service identity of the sending MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the sending Application Server.
Recipient UE Service ID/AS Service ID (see NOTE 1, NOTE 2)	O	The service identity of the receiving MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the receiving Application Server. This IE is mandatory for Point-to-Point messaging, AS-to-Point messaging, AOMT messaging and MOAT messaging and is not present in other message scenarios.
Group Service ID (see NOTE 1)	O	The service identifier of the target MSGin5G Group. This IE is mandatory for a Group Message and is not present in other message scenarios.
Broadcast Area ID (see NOTE 1)	O	The service identifier of the Broadcast Service Area where the message needs to be broadcast. This IE is mandatory in the Broadcast Message and is not present in other message scenarios.
Messaging Topic (see NOTE 1)	O	Indicates which Messaging Topic this message is related to. This IE is mandatory for a message distribution based on topic and is not present in other message scenarios.

Application ID	O	Identifies the application(s) for which the payload is intended. This list of Application IDs IE is required when the message is sent to one or multiple Application Clients served by same MSGin5G Client. This list of Application IDs IE may be included when the message is sent to an Application Server or to an Application Client. MSGin5G Server is unaware of the content.
Message ID	M	Unique identifier of this message.
Delivery status required	O	Indicates if delivery acknowledgement from the recipient is requested.
Payload	O	Payload of the message. MSGin5G Server/Client is unaware of the content. If the request is sent from MSGin5G Client or Message Gateway to the MSGin5G Server, the maximum size of this IE is a configurable value that shall not exceed 2048 octets.
Priority type (see NOTE 3)	O	Application priority level requested for this message. The application priority levels include High, Normal and Low. The default Priority type of an MSGin5G message is Normal.
Message is segmented	O	Indicates this message is part of a segmented message.
Segmentation set identifier	O	All segmented messages associated within the same set of segmented messages (i.e. associated with the same MSGin5G message) are assigned the same unique identifier. Mandatory IE to be present in every segmented message.
Total number of message segments	O	Indicates the total number of segments for the message. The Total Segments needs to be included only in the first segment of the message.
Message segment number	O	An incrementing message segment number that indicates segmented message number of each segmented message within a set of segmented messages
Last segment flag	O	An indicator of whether this segmented message is the last segment in the set of segmented messages or not. The Last Segment Flag needs to be included only in the last segment of the message. Message segment number of the segment with "Last Segment Flag" set can be considered as total segments.
Store and forward flag	M	An indicator of whether store and forward services are requested for this message. If the value indicates that store and forward services are requested by the sender, the store and forward procedure in clause 8.3.6 applies.
Store and forward parameters	O	Parameters used by MSGin5G Server for providing store and forward services, as detailed in table 8.3.2-2. This IE shall be included only if the value of the Store and forward flag IE indicates that store and forward services are requested. The MSGin5G store and forward procedure is detailed in clause 8.3.6.
NOTE 1: Only one of these IEs shall be included to represent the type of message request. The MSGin5G Client may construct the related IEs based on the information received from Application Client, e.g. adds the MSGin5G service domain. NOTE 2: When the originator is an Application Server, (i.e. Originating AS Service ID is present), this IE shall be a UE Service ID. NOTE 3: The MSGin5G message with high priority should not be aggregated. The other usages of the priority level of the message is implementation specific and is out of scope of this document.		

Table 8.3.2-2: Store and forward parameters

Value	Status	Description
Message expiration time	O	Indicates message expiration time used for providing store and forward services if the destination is not available for communications, The MSGin5GServer attempts delivery at or before the message expiration time, or when the recipient becomes available.
Application specific store and forward information	O	Application specific information about store and forward handling, e.g. a delivery time/date.

- 3. The MSGin5G Server verifies that the sender is authorized to send the message and checks the integrity of the message.

If the received MSGin5G message request is for a Group Message, the MSGin5G Server shall generate an individual message to all group members (excluding the message originator) with additional Recipient UE Service ID to each individual message as shown in table 8.3.3-1.

If the received MSGin5G message is a Message Topic message, the MSGin5G Server shall generate an individual message to all subscribers subscribing this message topic (excluding the message originator) with additional Recipient UE Service ID to each individual message as shown in table 8.3.3-1.

- 4. The MSGin5G Server may send a Message response to the originating entity if the message is rejected or stored and includes the IEs as listed in table 8.3.2-3 in the response.

Table 8.3.2-3: Message response

Information element	Status	Description
Originating UE Service ID/AS Service ID	M	The identity of the MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the identity of the Application Server that initiated the Request that is being responded to.
Message ID	M	Identifier of the Request that is being responded to.
Segment set identifier	O	Included in the message response if the originating message was a segmented message.
Delivery Status	O	Indicates if delivery is a failure, or if the message is stored for deferred delivery.
Failure Cause	O	The reason for failure

8.3.3 MSGin5G messages termination procedure

Figure 8.3.3-1 shows the procedure for the MSGin5G Server that delivers an MSGin5G message.

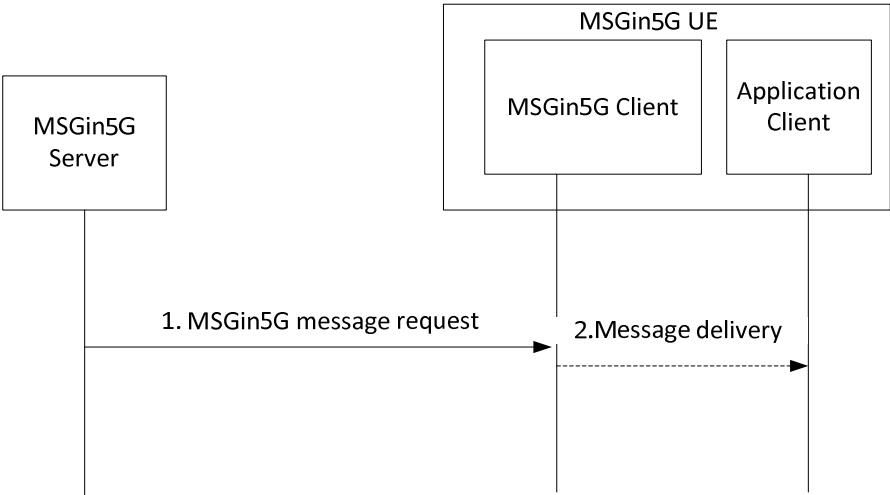


Figure 8.3.3-1: MSGin5G message towards UE

Figure 8.3.3-2 shows the same procedure (step 1 only), however for the MSGin5G Server that delivers the message to an Application Server by application request.

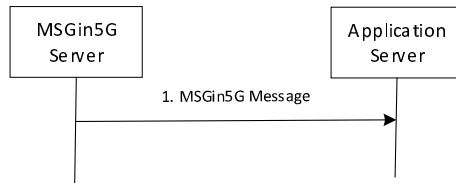


Figure 8.3.3-2: Message towards an Application Server

Figure 8.3.3-3 shows the procedure for the MSGin5G Server that delivers an MSGin5G message to a Legacy 3GPP Message Gateway, a Non-3GPP Message Gateway, or a Broadcast Message Gateway.

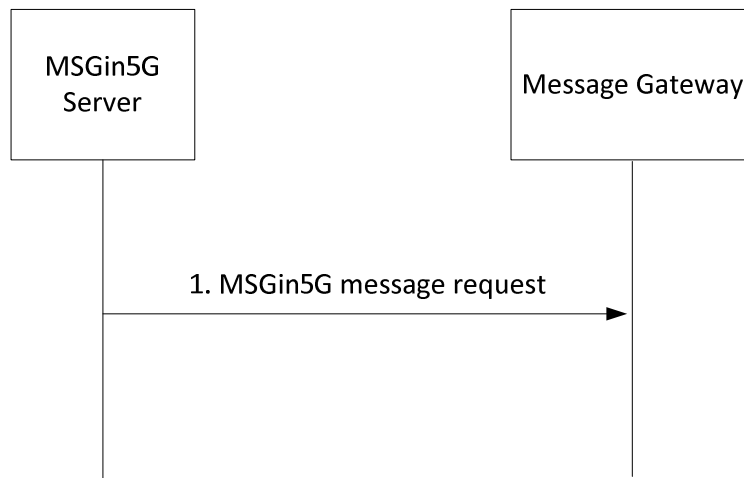


Figure 8.3.3-3: MSGin5G message towards a Message Gateway

The following procedure applies to the above figures 8.3.3-1, 8.3.3-2 and 8.3.3-3 with the exception that step 2 only applies to figure 8.3.3-1.

1. The MSGin5G Server delivers the received MSGin5G message as listed in table 8.3.3-1.

Table 8.3.3-1: MSGin5G message request from MSGin5G Server

Information element	Status	Description
Originating UE Service ID/AS Service ID	M	The service identity of the originating MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the originating Application Server.
Recipient UE Service ID/AS Service ID	O	The service identity of the receiving entity. For Group messaging, this IE can be a Recipient UE Service ID only. This IE is fetched from the participant information of the recipient in the group profile. For message delivery based on Messaging Topic subscription, this IE is the UE Service ID/AS Service ID of the Messaging Topic subscriber.
Broadcast Area ID	O	The identifier of the Service Area where the message needs to be broadcast.
Application ID	O	Identifies the application for which the payload is intended.
Message ID	M	Unique identifier of this message.
Delivery status required	O	Indicates if delivery acknowledgement from the recipient is requested.
Payload	O	Payload of the message.
Message is segmented	O	Indicates this message is part of a segmented message.
Group Service ID	O	The service identifier of a Group.
Messaging Topic	O	Indicates which Messaging Topic this message is related to.
Segmentation Set Identifier	O	All segmented messages associated within the same set of segmented messages (i.e. associated with the same MSGin5G message) are assigned the same unique identifier.
Total number of message	O	Indicates the total number of segments for the message.

segments		The Total Segments needs to be included only in the first segment of the message.
Message segment number	O	An incrementing message segment number that indicates segmented message number of each segmented message within a set of segmented messages.
Last Segment Flag	O	An indicator of whether this segmented message is the last segment in the set of segmented messages or not. The Last Segment Flag needs to be included only in the last segment of the message. Message segment number of the segment with "Last Segment Flag" set can be considered as total segments.
Priority type	O	Application priority level requested by the message originator for this message.

8.3.4 MSGin5G message delivery status report into the MSGin5G Server

Figure 8.3.4-1 shows the procedure for an MSGin5G UE that initiates an MSGin5G message delivery status report.

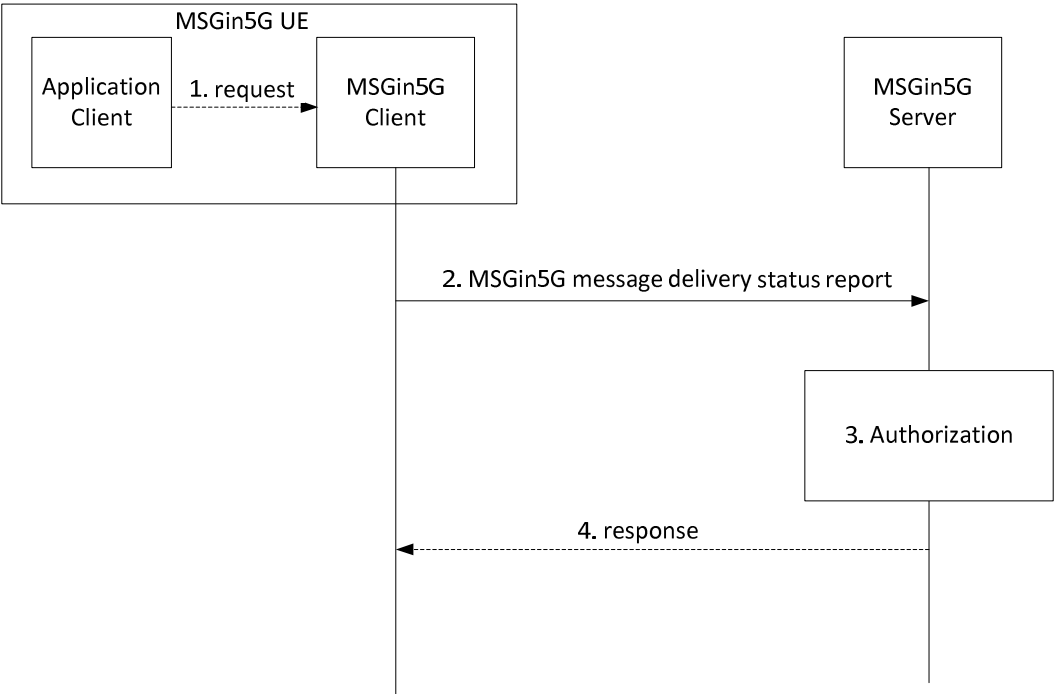


Figure 8.3.4-1: Message delivery status report from MSGin5G UE

Figure 8.3.4-2 shows the procedure for an Application Server that initiates an API request for MSGin5G message delivery status report specified in clause 9.1.1.4 to UE.

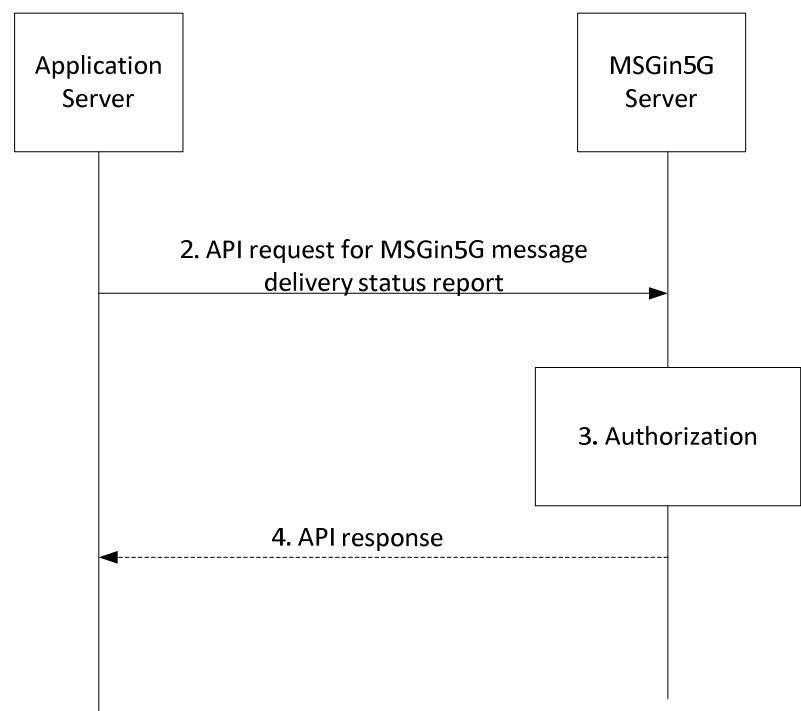


Figure 8.3.4-2: Message delivery status report from Application Server

Figure 8.3.2-3 shows the procedure for a Legacy 3GPP Message Gateway or a Non-3GPP Message Gateway that sends an MSGin5G message delivery status report to the MSGin5G Server on behalf of a Legacy 3GPP UE or Non-3GPP UE.

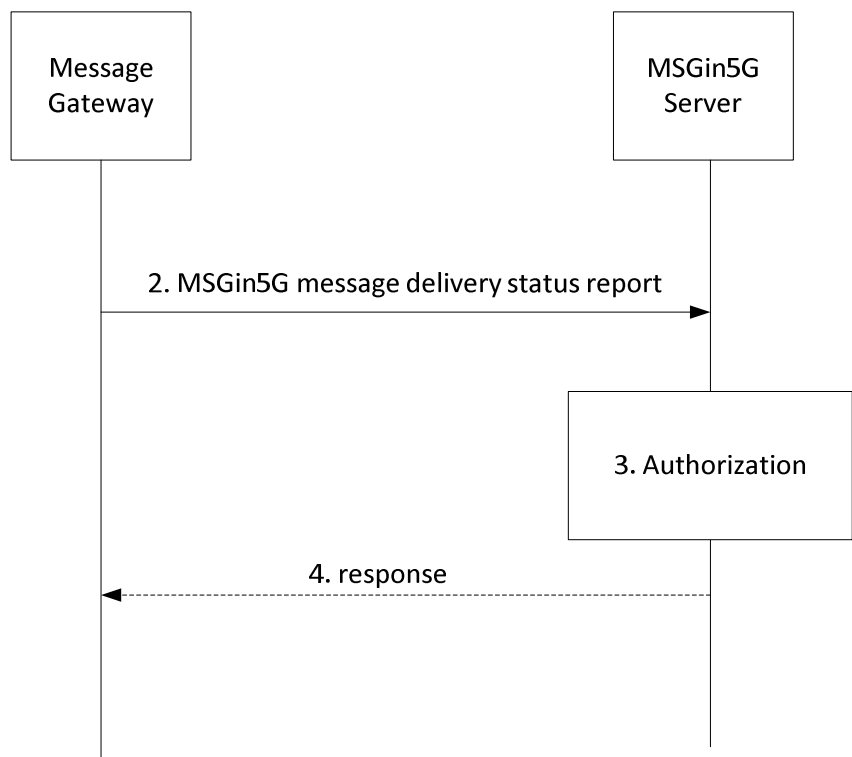


Figure 8.3.4-3: Message delivery status report from Message Gateway (on behalf of Non-MSGin5G UE)

Pre-conditions:

- 1. The sender of an MSGin5G message has asked for a message delivery status report.

Procedures:

The following procedure applies to the above figures 8.3.4-1, 8.3.4-2 and 8.3.4-3 with the exception that step 1 only applies to figure 8.3.4-1.

1. The Application Client in the MSGin5G UE sends a request to the MSGin5G Client for invoking the MSGin5G Client to send an MSGin5G message delivery status report to a recipient.

NOTE: The APIs provided by the MSGin5G Client to the Application Client are implementation specific in this release.

2. As shown in figure 8.3.4-1 or 8.3.4-3, the MSGin5G Client or Message Gateway sends the MSGin5G message delivery status report to the MSGin5G Server and includes the IEs as listed in table 8.3.4-1, or as shown in figure 8.3.4-2, the Application Server sends an API request to the MSGin5G Server for sending an MSGin5G message, the API request includes the IEs as listed in table 8.3.4-1.

Table 8.3.4-1: Message delivery status report to MSGin5G Server

Information element	Status	Description
Originating UE Service ID/AS Service ID	M	The service identity of the sending MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the sending Application Server.
Recipient UE Service ID/AS Service ID (NOTE)	M	The service identity of the receiving MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the receiving Application Server. This is the sender of the message that this message delivery status report is for.
Message ID	M	Unique identifier of message delivery status report. The message ID of the MSGin5G message that is being acknowledged is included in this IE.
Failure Cause	O	The Failure Cause indicates the failure reason, if applicable.
Delivery Status	M	The delivery status description, including success or failure in delivery
NOTE: When the originator is an Application Server, (i.e. Originating AS Service ID is present), this IE shall be a UE Service ID.		

3. The MSGin5G Server verifies that the sender is authorized to send the message delivery status report.
4. The MSGin5G Server may send a response to the originating entity if the message delivery status report is rejected and includes the IEs as listed in table 8.3.2-3 in the response.

8.3.5 MSGin5G message delivery status report from the MSGin5G Server

Figure 8.3.5-1 shows the procedure for the MSGin5G Server that forwards an MSGin5G message delivery status report to an MSGin5G UE.

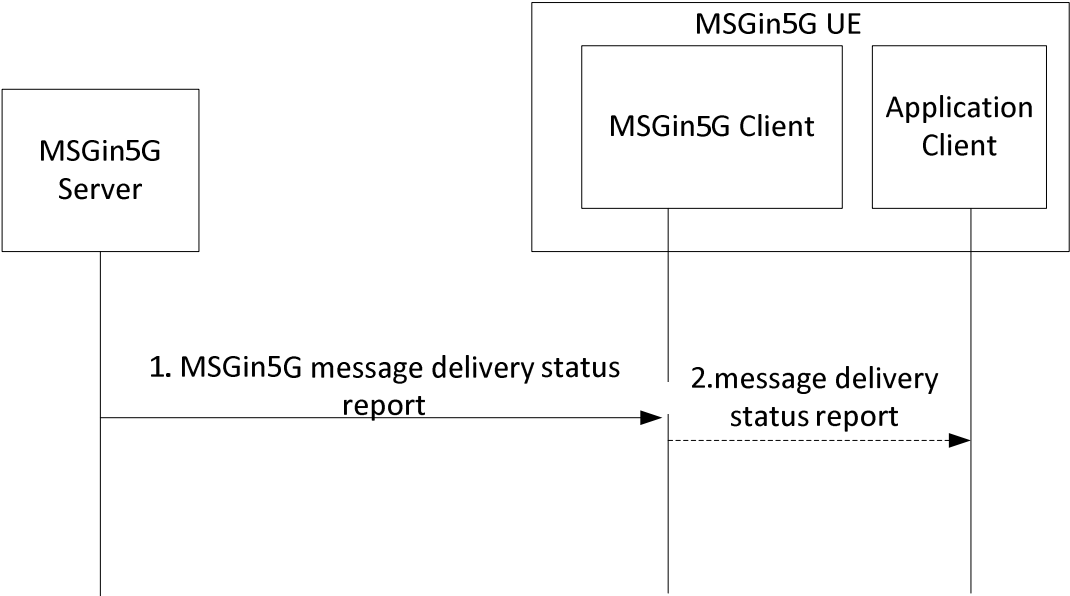


Figure 8.3.5-1: Message delivery status report towards an MSGin5G UE

Figure 8.3.5-2 shows the procedure for the MSGin5G Server that forwards an MSGin5G message delivery status report to an Application Server.

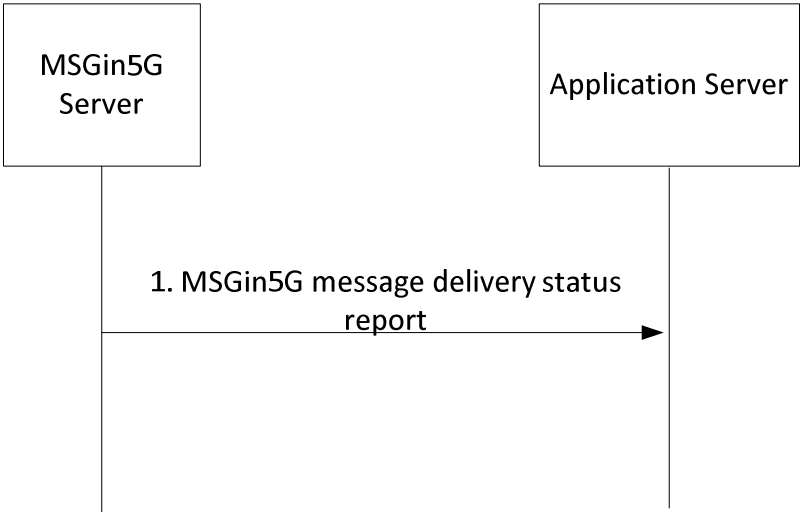


Figure 8.3.5-2: Message delivery status report towards an Application Server

Figure 8.3.5-3 shows the procedure for the MSGin5G Server that forwards an MSGin5G message delivery status report to a Legacy 3GPP Message Gateway or a Non-3GPP Message Gateway.

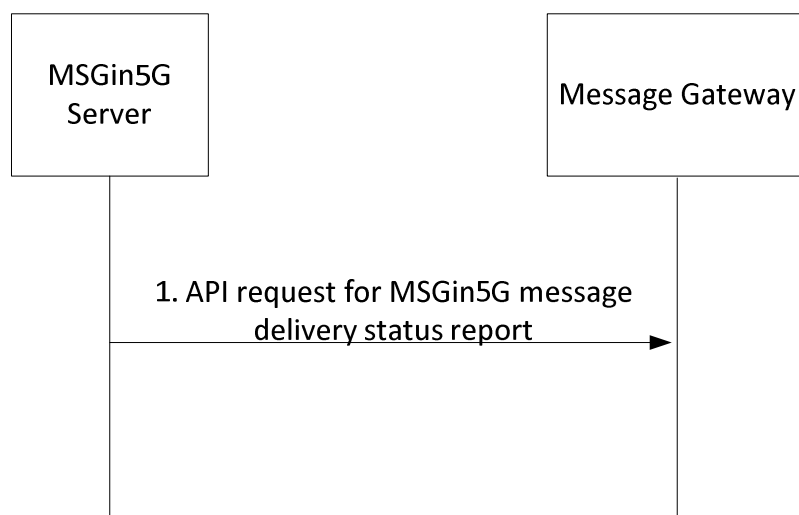


Figure 8.3.5-3: Message delivery status report towards a Message Gateway

The following procedure applies to the above figures 8.3.5-1, 8.3.5-2 and 8.3.5-3 with the exception that step 2 only applies to figure 8.3.5-1.

1. the MSGin5G Server sends the MSGin5G message delivery status report to the MSGin5G UE or Message Gateway and includes the IEs as listed in table 8.3.5-1, or as shown in figure 8.3.5-2 and figure 8.3.5-3, the MSGin5G Server sends an API request to the Application Server for sending an MSGin5G message, the API request includes the IEs as listed in table 8.3.5-1.

Table 8.3.5-1: Message delivery status report to MSGin5G Server

Information element	Status	Description
Originating UE Service ID/AS Service ID	M	The service identity of the sending MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the sending Application Server.
Recipient UE Service ID/AS Service ID (see NOTE)	M	The service identity of the receiving MSGin5G Client, Legacy 3GPP UE, Non-3GPP UE or the receiving Application Server. This is the sender of the message that this message delivery status report is for.
Message ID	M	Unique identifier of message delivery status report. The message ID of the MSGin5G message that is being acknowledged is included in this IE.
Failure Cause	O	The Failure Cause indicates the failure reason, if applicable.
Delivery Status	M	The delivery status description, including success or failure in delivery.
NOTE: When the originator is an Application Server, (i.e. Originating AS Service ID is present), this IE shall be a UE Service ID.		

2. The MSGin5G Client sends the MSGin5G message delivery status report to Application Client.

8.3.6 MSGin5G Store and Forward

Figure 8.3.6-1 shows the procedure for providing store and forward services for MSGin5G message requests.

This procedure applies when an MSGin5G message is received at the MSGin5G Server for delivery and the message cannot be delivered to the recipient UE; otherwise, the procedure detailed in clause 8.3.2 applies.

Pre-conditions:

1. The MSGin5G Client or Application Server has registered to the MSGin5G Server.
2. The MSGin5G Server has determined that the recipient UE is not available.

NOTE: In addition to UE registration status, the MSGin5G Server can use e.g, UE reachability status monitoring specified in clause 8.9.2 or the recipient's Communication Availability information specified in clause 8.2 to determine whether the recipient is available and reachable for message delivery.

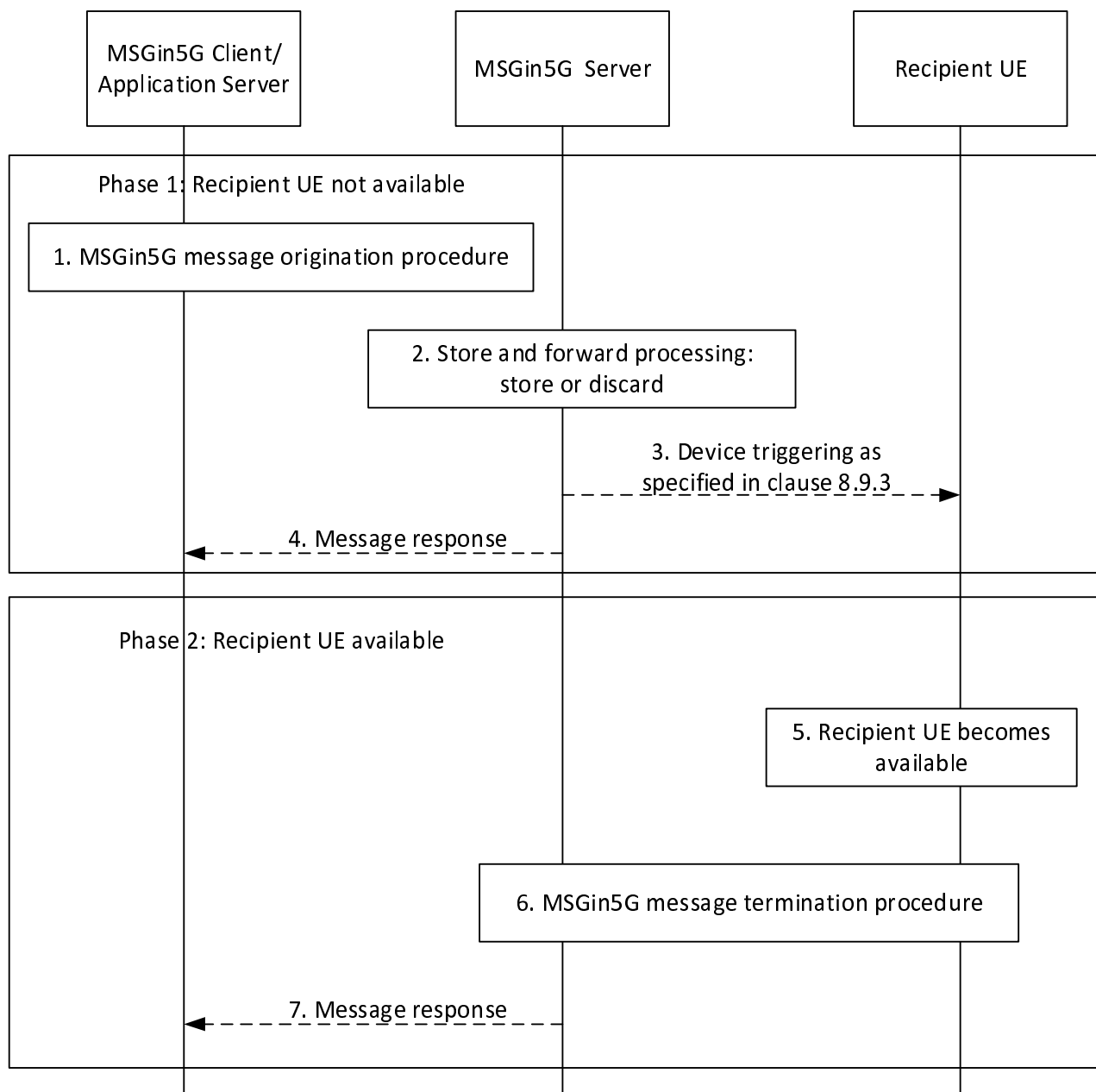


Figure 8.3.6-1: Store and forward procedure

1. MSGin5G message origination handling, see steps 1-3 in clause 8.3.2. The value of the Store and forward flag IE (see Table 8.3.2-1) in the MSGin5G message indicates that store and forward services are requested by the sender.
2. The MSGin5G Server checks the registration information of the recipient UE. If the Store and forward option IE (see Table 8.2.1-3) indicates that the recipient UE opts out of store and forward services, the message is discarded and the procedure proceeds with step 4 and ends with step 4. If the Store and forward flag IE (see Table 8.3.2-1) in the received message indicates that store and forward services are not requested by the sender, the message is discarded and the procedure proceeds with step 4 and ends with step 4.

If store and forward processing is required, the MSGin5G Server uses the Application specific store and forward information IE (see Table 8.3.2-2) to determine storage and forwarding.

3. Before the Message expiration time is expired, the MSGin5G Server may trigger the Recipient UE based on the MSGin5G device triggering procedure in clause 8.9.3.
4. The MSGin5G Server may send a message response as defined in table 8.3.2-3 which includes store and forward status information in the Delivery Status IE, e.g., that the delivery had been deferred, or has been discarded.
5. The recipient UE becomes available.
6. When the recipient UE becomes available, the MSGin5G Server attempts delivery of the request using the procedure specified in clause 8.3.3.

If the UE does not become available prior to the expiration time, the MSGin5G Server attempts delivery of the request at the message expiration time and the stored message is discarded or apply local implementation afterwards.

7. The MSGin5G Server may send a message response as defined in table 8.3.2-3 which includes store and forward status information in the Delivery Status IE, e.g., that the message was discarded.

8.4 Message Aggregation

8.4.1 General

Based on maximum segment size allowed to transmit over available transport, the MSGin5G Service can optimize communications by aggregating one or more messages towards the same target. The target may be an UE, an Application Server, a Broadcast Area, an MSGin5G Group or a Messaging Topic.

The following pre-conditions apply for message aggregation:

1. The recipient UE(s) support an MSGin5G Client or the (Legacy-3GPP and non-3GPP) Message Gateway supports the MSGin5G Client capability.
2. The MSGin5G Client 1 and MSGin5G Client 2 are registered with the MSGin5G Server, or an Application Server has established a secured communication with the MSGin5G Server.

8.4.2 Message Aggregation at MSGin5G Client

Figure 8.4.2-1 shows the procedure for an MSGin5G Client aggregating a set of Point-to-Point messages each carrying small amounts of data. All of the Point-to-Point messages to be aggregated are targeted to the same UE.

NOTE 1: Aggregation of multiple messages can also be done with the Application Client; in this case it is implementation specific and out of the scope of the current specification.

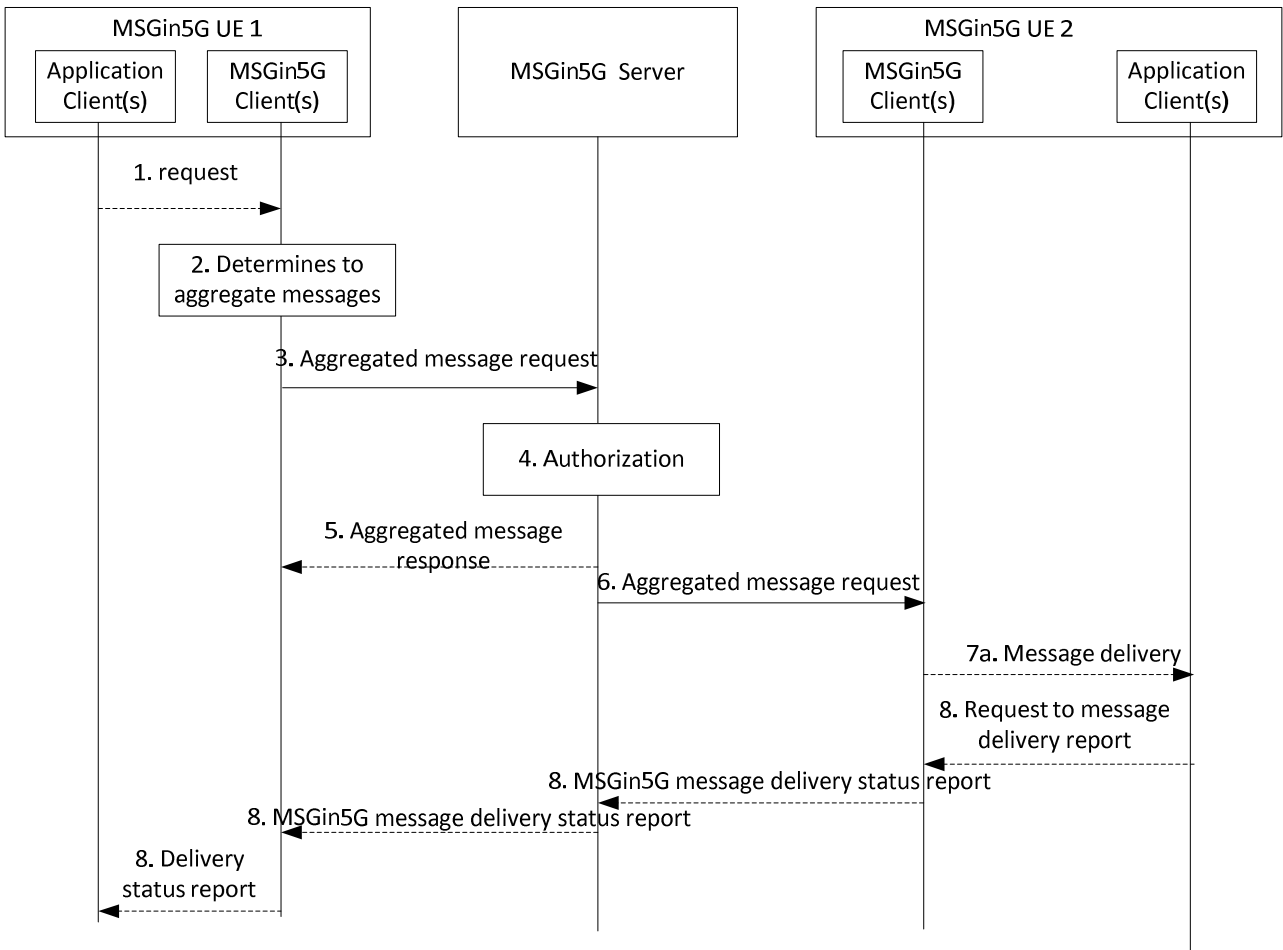


Figure 8.4.2-1: MSGin5G UE aggregates messages towards target MSGin5G UE

Figure 8.4.2-2 shows the procedure for an MSGin5G Client aggregating a set of Point-to-AS messages each carrying small amounts of data. All of the Point-to-AS messages to be aggregated are sent to same Application Server.

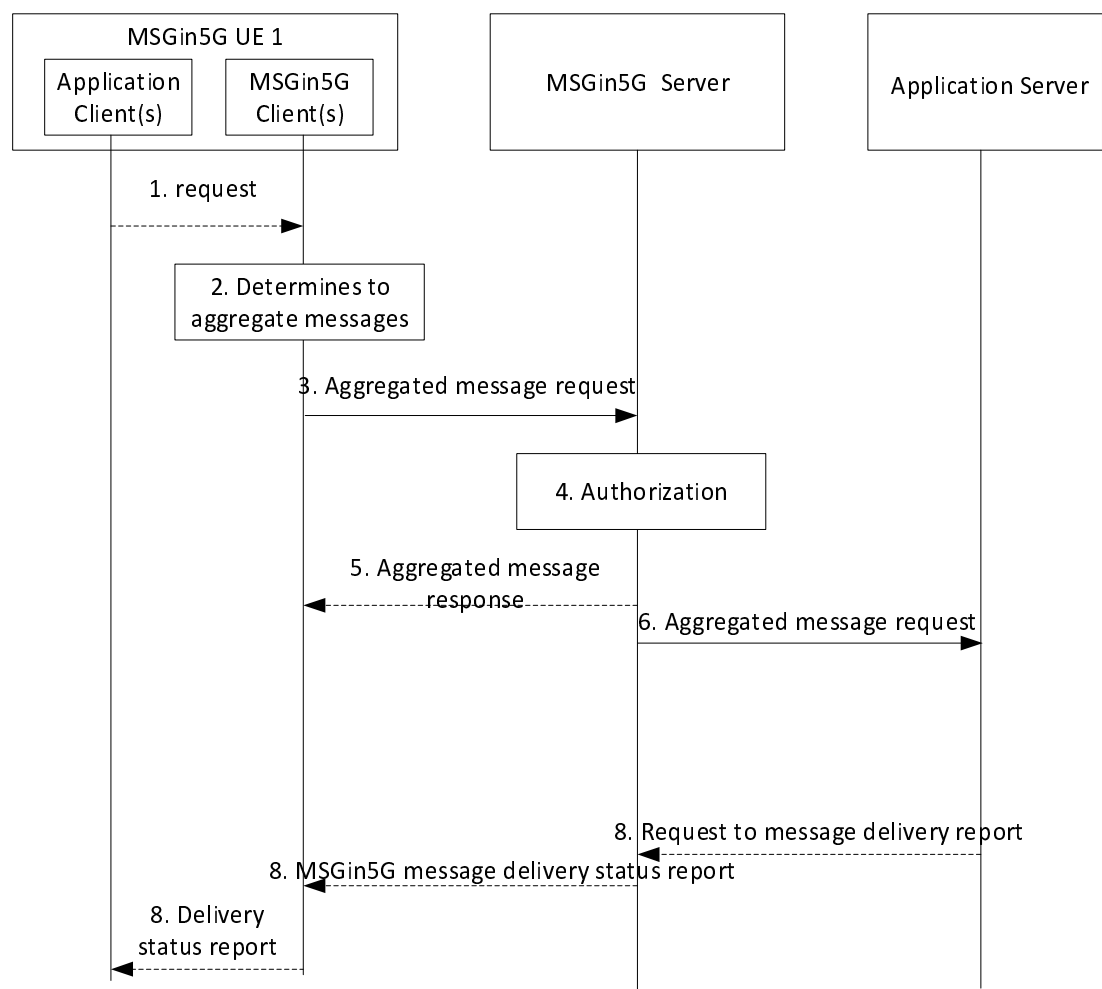


Figure 8.4.2-2: MSGin5G UE aggregates messages towards target Application Server

Figure 8.4.2-3 shows the procedure for an MSGin5G Client aggregating a set of Point-to-Point messages each carrying small amounts of data. All of the Point-to-Point messages to be aggregated are sent to same recipient Non-MSGin5G UE.

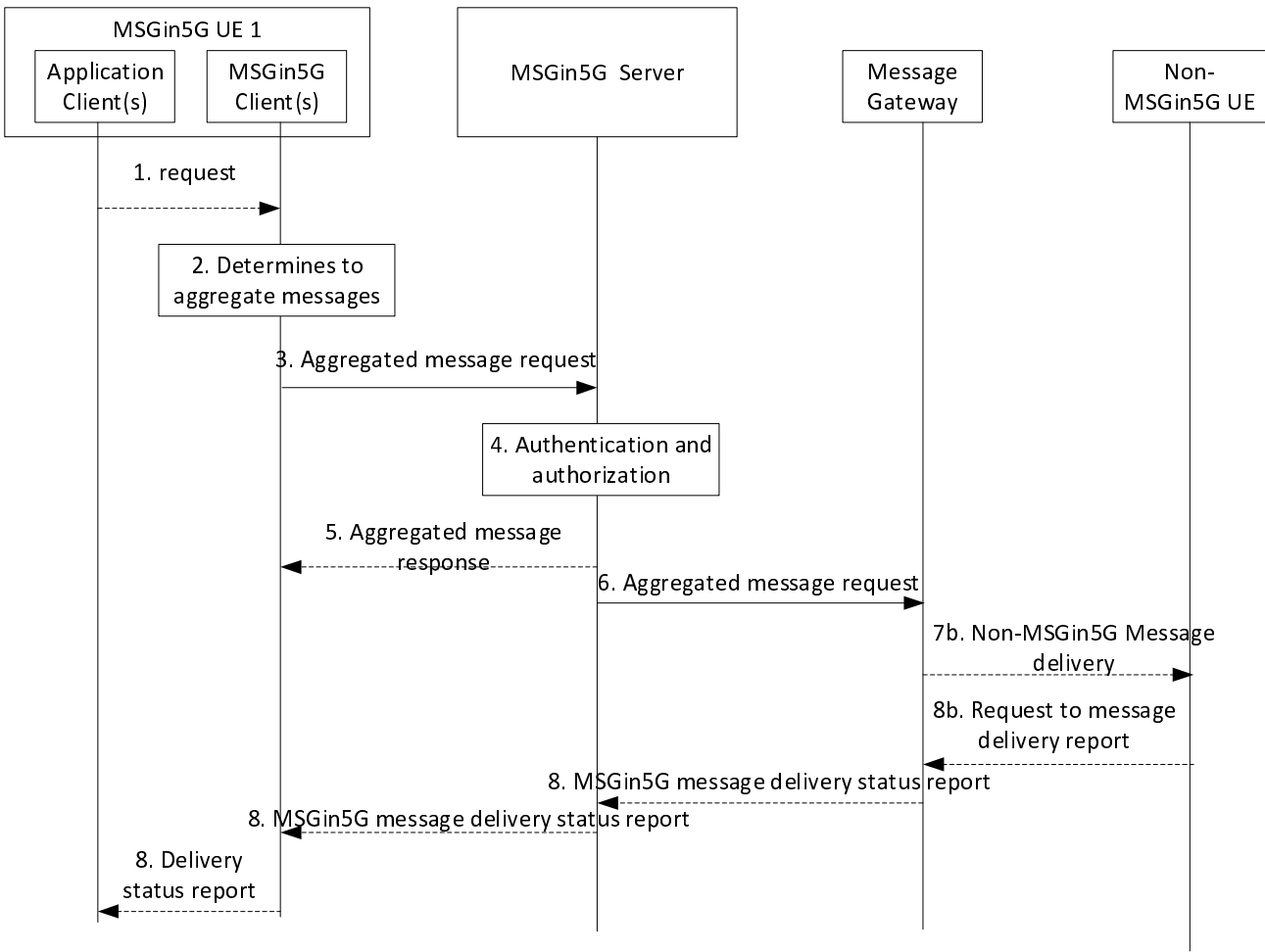


Figure 8.4.2-3: MSGin5G UE aggregates messages towards target Non-MSGin5G UE

Figure 8.4.2-4 shows the procedure for an MSGin5G Client sends aggregated message to a MSGin5G group. All of the messages to be aggregated are sent to same MSGin5G Group.

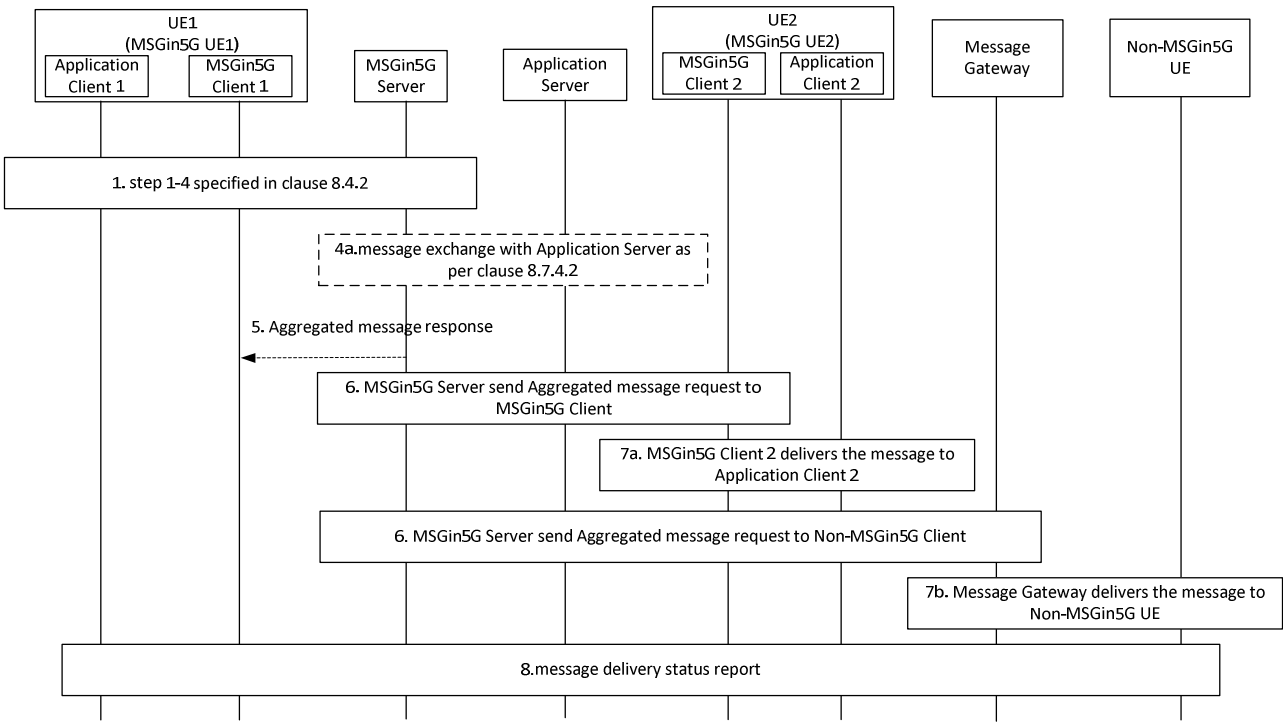


Figure 8.4.2-4: MSGin5G UE sends aggregated messages towards target MSGin5G Group

Figure 8.4.2-5 shows the procedure for an MSGin5G Client sends aggregated message based on Messaging Topic. All the messages to be aggregated have the same Messaging Topic.

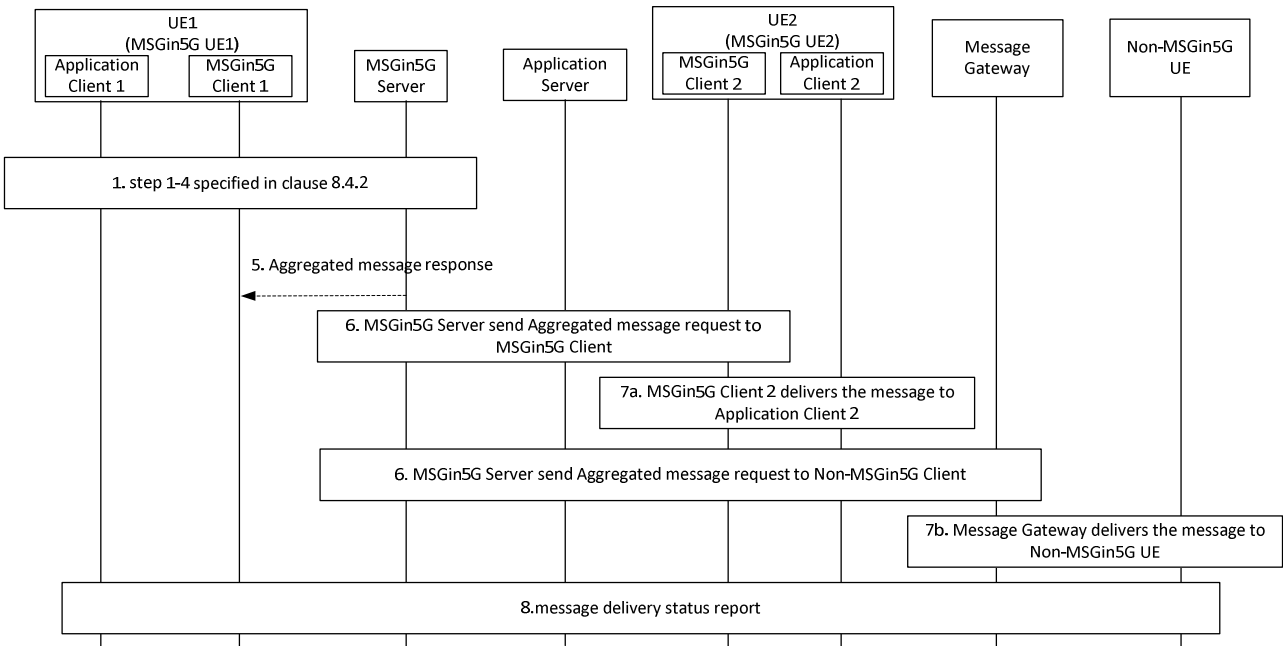


Figure 8.4.2-5: MSGin5G UE sends aggregated messages towards target MSGin5G Group

Figure 8.4.2-6 shows the procedure for an MSGin5G Client aggregating a set of Broadcast messages each carrying small amounts of data. All of the Broadcast messages to be aggregated are sent to same Broadcast Area.

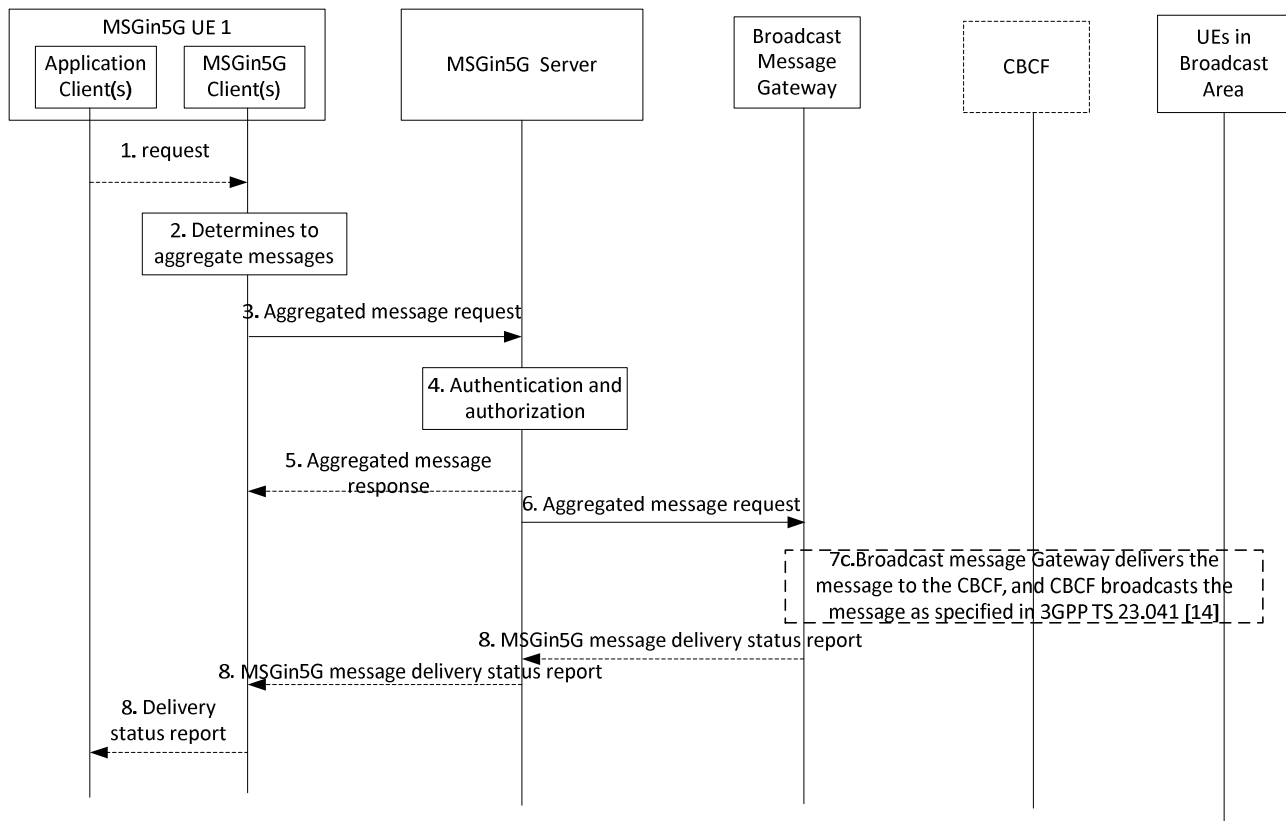


Figure 8.4.2-6: MSGin5G UE aggregates messages towards target Broadcast Area

The following procedure applies to the above figures 8.4.2-1 to 8.4.2-6 with the exception that:

- a) step 4a only applies to figure 8.4.2-4
- b) step 7a only applies to figure 8.4.2-1 and figure 8.4.2-4;
- c) step 7b only applies to figure 8.4.2-3. and figure 8.4.2-4; and
- d) step 7c only applies to figure 8.4.2-6.

1. Application Client(s) initiates a request to the MSGin5G Client 1 to send a message to another target. The target may be an MSGin5G UE, a Non-MSGin5G UE, an Application Server, a MSGin5G group, or a broadcast area. the Application Client(s) may also initiate a request to the MSGin5G Client 1 to send a message which is to be delivered based on Messaging Topic.
2. The MSGin5G Client 1 checks if aggregation is allowed for this message as per the service configuration. The MSGin5G Client 1 also checks the message data size and the priority level to determine if the received message can be aggregated. For example, MSGin5G Client 1 finds that the message has a small payload size when compared to the maximum segment size that can be transmitted over available transport and is not high priority message (i.e. the value of Priority type included in the message is not "High"), the MSGin5G Client 1 may aggregate this message. The MSGin5G Client 1 may continue aggregating messages until an optimal segment size is reached before sending the aggregated message. When the aggregation is finished, e.g. the optimal segment size is reached or other conditions such as waiting time configured by service provider is fulfilled, the MSGin5G Client sends the aggregated message as per scheduling policy towards a selected target.

NOTE 2: The condition(s) when the aggregation is needed to be finished is implementation specific.

NOTE 3: The configuration of whether aggregation is allowed for MSGin5G messages and how the MSGin5G Client 1 uses information such as individual message priority, maximum time to wait, etc for aggregating and sending is out of scope of the present document.

NOTE 4: The maximum segment size that can be transmitted over available transport is configured to the MSGin5G Client 1 in the MSGin5G Service specific information IE as specified in Table 8.1.2-2.

3. The MSGin5G Client 1 aggregates multiple MSGin5G message requests intended for a selected target and sends the Aggregated message request containing the information elements specified in Table 8.4.2-1 and Table 8.4.2-2 according to scheduling policy towards the MSGin5G Server.

Table 8.4.2-1: Aggregated message request (MSGin5G Client to MSGin5G Server)

Information element	Status	Description
Originator UE Service ID	M	The service identity of the sending MSGin5G Client.
Recipient UE Service ID/AS Service ID (see NOTE)	O	The service identity of the receiving MSGin5G Client or the receiving Application Server.
Group Service ID (see NOTE)	O	The service identifier of the target MSGin5G Group.
Messaging Topic (see NOTE)	O	Indicates which Messaging Topic this message is related to.
Broadcast Area ID (see NOTE)	O	The service identifier of the Broadcast Area where the message needs to be broadcast.
Message ID	M	Unique identifier of this aggregated message
Number of individual messages	M	Indicates total number of messages which are aggregated into this message
List of individual messages	M	Each element in this list contains information elements as specified in Table 8.4.2-2.
Store and forward flag	O	An indicator of whether store and forward services are requested for this aggregated message. The store and forward services can be applied to the aggregated message only if all messages in this aggregated message can be store and forwarded.
Store and forward parameters	O	Parameters used by MSGin5G Server for providing store and forward services, as detailed in table 8.3.2-2. This IE shall be included only if the value of the Store and forward flag IE indicates that store and forward services are requested.
NOTE Only one of these IEs shall be included to represent the type of message request.		

Table 8.4.2-2: Individual message data

Information element	Status	Description
Individual Message ID	M	Unique identifier of this individual message.
Application ID	O	Identifies the application for which the payload is intended.
Delivery status required	O	Indicates if delivery acknowledgement from the recipient is requested.
Payload	M	Payload of the message
Priority type	O	Application priority level requested for this message as specified in Table 8.3.2-1 except that the value of this IE should not be High.

NOTE 5: Total size of Aggregated message request is less than or equal to maximum segment size allowed to be transmitted over available transport.

4. MSGin5G Server checks whether the MSGin5G Client 1 is authorized to send the Aggregated message request.
- 4a The MSGin5G Server performs the necessary message exchanging procedure with the Application Server as per clause 8.7.4.2.
5. The MSGin5G Server sends the Aggregated message response to the MSGin5G Client 1 in the cases listed below. The information elements defined in Table 8.4.2-3 shall be included in the response.:
- a) MSGin5G Client 1 is not authorized to send Aggregated message request; or
 - b) the Aggregated message request is not valid; or
 - c) if MSGin5G Client 1 is authorized but the message is stored for deferred delivery.

Table 8.4.2-3: Aggregated message response (MSGin5G Server to MSGin5G Client)

Information element	Status	Description
Original MSGin5G Client ID	M	The identity of the MSGin5G Client sending the original message.
Message ID	M	Unique identifier of the original aggregated message
Delivery Status	O	Indicates if delivery is a failure, or if the message is stored for deferred delivery.
Failure Cause	O	This IE contains the failure reason, e.g. the originator is not authorized to send a message request or one of the multiple messages aggregated has an issue, may be included in this IE.

6. If MSGin5G Client 1 is authorized to send an Aggregated message request, the MSGin5G Server sends the Aggregated message request towards the selected target as specified in clause 8.3.3. If the aggregated message is sent to a recipient whose supported message segment size is smaller than the aggregated message, the MSGin5G Server should remove the last individual message in the List of individual messages element from the aggregated message until the aggregated message is smaller than the maximum segment size that can be transmitted over available transport. The MSGin5G messages removed from the aggregated message may be sent individually or aggregated again by the MSGin5G Server according to service configuration.

7a. If the recipient of the aggregated message is MSGin5G UE 2, the MSGin5G Client 2 in the MSGin5G UE 2 splits the received Aggregated message request into multiple individual MSGin5G message requests. The content of each MSGin5G message is delivered to the recipient Application Client(s).

NOTE 6: The delivery between MSGin5G Client and Application Client is out of scope of the present document.

7b. If the recipient of the aggregated message is a Message Gateway on behalf of Non-MSGin5G UE, the Message Gateway splits the received Aggregated message request into multiple individual MSGin5G message requests. The content of each MSGin5G message is delivered to the Non-MSGin5G UE via Non-MSGin5G message delivery.

NOTE 7: The Non-MSGin5G message delivery is out of scope of this document.

7c. If the aggregated message needs to be delivered in the Broadcast Area, the Broadcast Message Gateway splits the received Aggregated message request into multiple individual MSGin5G message requests. The Broadcast Message Gateway broadcasts each individual MSGin5G message request to the MSGin5G UEs in the Broadcast Area, or broadcasts the content of each individual MSGin5G message request to the non-MSGin5G UEs in the Broadcast Area via CBCF. The procedures on CBCF are specified in 3GPP TS 23.041 [14].

8. The recipient MSGin5G Client/ Application Server/ Message Gateway may initiate sending a message delivery status report, if requested in the original message that is received as in Step 7a (for MSGin5G UE), step 7b (for Non-MSGin5G UE) or Step 6 (for Application Server). MSGin5G Client 2/ Application Server/ Message Gateway sends the message delivery status report towards the MSGin5G Client on MSGin5G UE 1 via MSGin5G Server.

NOTE 8: The message delivery status reports can also be aggregated into a single message.

8.4.3 Message aggregation at MSGin5G Server

Figure 8.4.3-1 shows the procedure for the MSGin5G Server aggregating a set of Application-to-Point messages targeted to the same recipient UE, set of group messages for the same MSGin5G group, or a set of messages delivered based on Messaging Topic for the same Messaging Topic, or a set of messages broadcasted to the same Service Area, each carrying a small amount data targeted towards the same target MSGin5G UE(s).

NOTE 1: Aggregation of multiple messages can also be done at the Application Server; in this case it is implementation specific and out of the scope of the current specification.

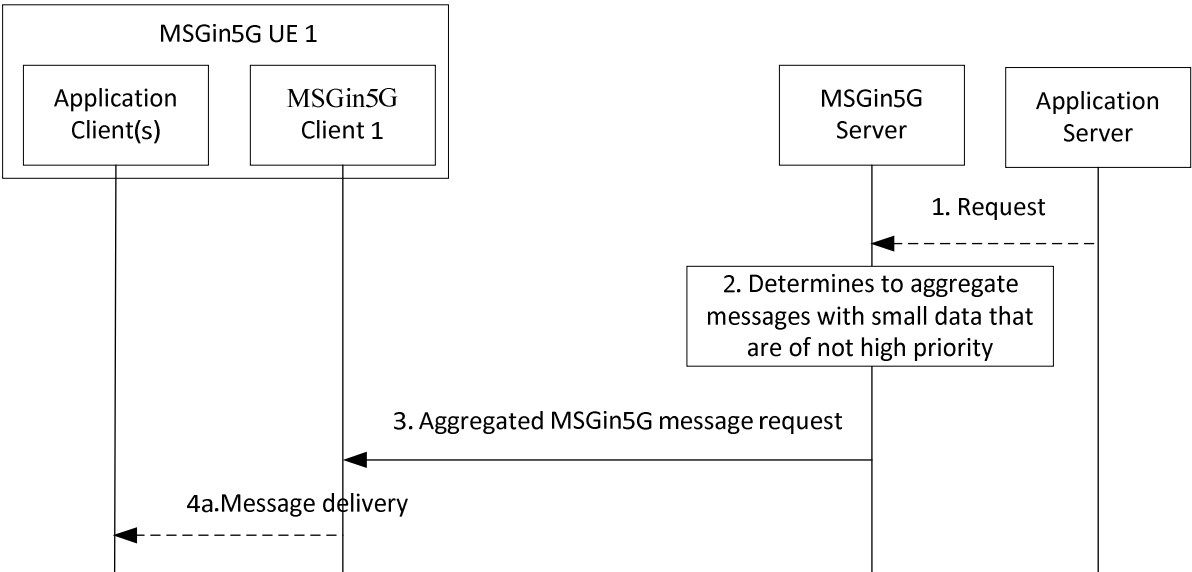


Figure 8.4.3-1: MSGin5G Server aggregates messages towards target MSGin5G UE

Figure 8.4.3-2 shows the procedure for MSGin5G Server aggregating a set of Application-to-Point messages targeted to the same recipient UE, or a set of group messages for the same MSGin5G group, or a set of messages delivered based on Messaging Topic for the same Messaging Topic, or a set of messages broadcasted to the same Service Area, each carrying a small amount data targeted towards the same target Non-MSGin5G UE(s).

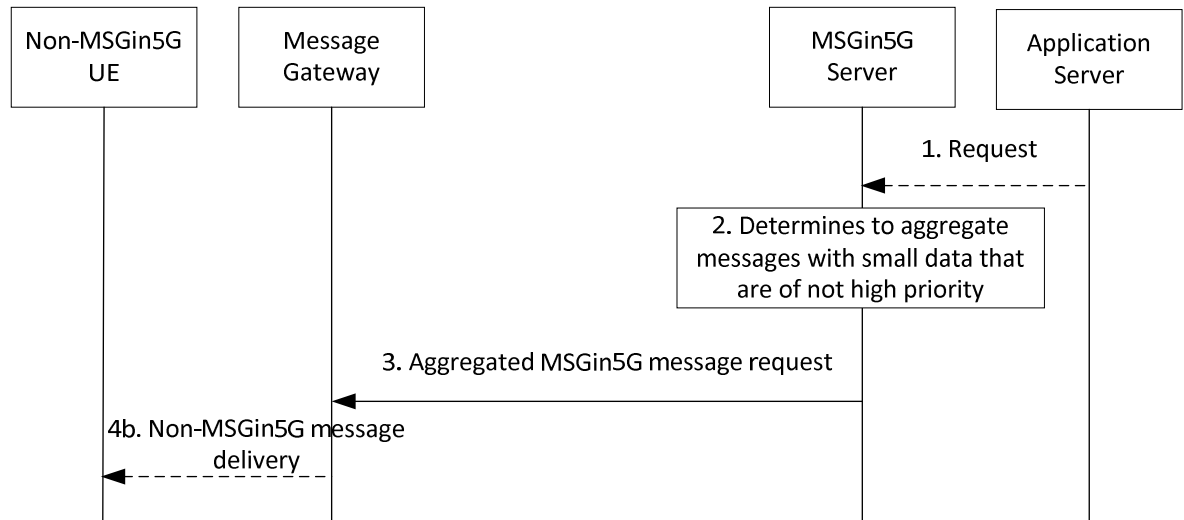


Figure 8.4.3-2: MSGin5G Server aggregates messages towards target Non-MSGin5G UE

Figure 8.4.3-3 shows the procedure for MSGin5G Server aggregating Broadcast messages, each carrying a small amount data targeted towards the target Broadcast Area.

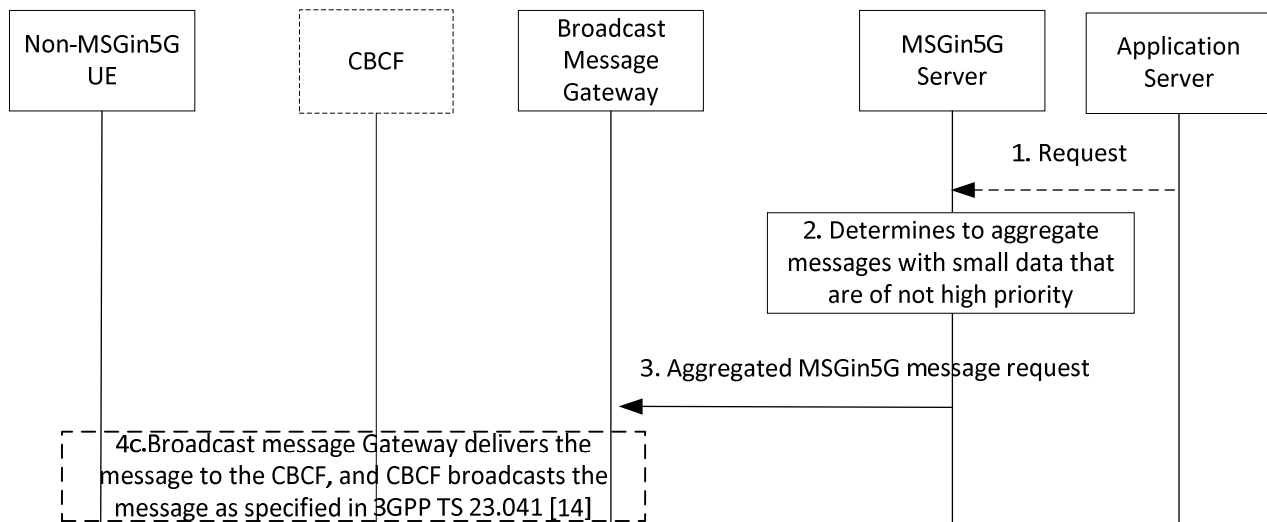


Figure 8.4.3-3: MSGin5G Server delivers aggregated message towards Non-MSGin5G UEs in the Broadcast Area

The following procedure applies to the above figures 8.4.3-1, 8.4.3-2 and 8.4.3-3 with the exception that step 4a only applies to figure 8.4.3-1, step 4b only applies to figure 8.4.3-2 and step 4c only applies to figure 8.4.3-3.

1. The Application Server initiates to send a set of Application-to-Point messages targeted to the same recipient UE, or a set of group messages for the same MSGin5G group, or a set of messages delivered based on Messaging Topic for the same Messaging Topic, or a set of messages broadcasted to the same Service Area, and sends the request to MSGin5G Server. The MSGin5G Server executes the MSGin5G messages origination procedure for each message as specified in clause 8.3.2.
2. The MSGin5G Server checks the message data size and the priority level of each message to determine if these messages, targeted to the same service end-point and of the same message type (i.e., either a set of Application-to-Point messages targeted to the same recipient UE, a set of group messages for the same MSGin5G group, a set of messages delivered based on Messaging Topic for the same Messaging Topic or a set of messages broadcasted to the same Service Area,), can be aggregated. For example, the MSGin5G Server finds that the messages have small payload size when compared to the maximum segment size that can be transmitted over available transport and are not high priority messages (i.e. the value of Priority type included in the message is not "High"), which could be sent as per scheduling policy towards a selected target.

NOTE 2: MSGin5G Server decides to continue aggregating messages until optimal use of segment size before sending message towards MSGin5G Client 1.

3. The MSGin5G Server aggregates multiple MSGin5G message requests intended for the target UE. The Aggregated message request contain the information elements as defined in Table 8.4.3-1 and Table 8.4.2-2. The MSGin5G Server delivers the Aggregated message request by using the MSGin5G messages termination procedure specified in clause 8.3.3.

Table 8.4.3-1: Aggregated message request (MSGin5G Server to MSGin5G Client)

Information element	Status	Description
Originating AS Service ID	M	The service identity of the sending Application Server.
Recipient UE Service ID	O	The service identity of the receiving MSGin5G Client. This IE is Mandatory for all type of message request except the broadcast message.
Group Service ID (see NOTE)	O	The service identifier of the target MSGin5G Group. This IE should be present if the aggregated message is a set of group messages for the same MSGin5G group.
Messaging Topic (see NOTE)	O	Indicates which Messaging Topic this message is related to. This IE should be present if the aggregated message is a set of message delivered based on Messaging Topic for the same Messaging Topic
Broadcast Area ID (see NOTE)	O	The identifier of the Service Area where the message needs to be broadcast.
Message ID	M	Unique identifier of this message
Number of individual messages	M	Indicates total number of messages which are aggregated into single message
List of Individual messages	M	Each element in this list contains information as specified in Table 8.3.3-1
NOTE: Only one of these IEs shall be included to represent the type of message request.		

NOTE 3: Total size of Aggregated message request is less than or equal to maximum segment size allowed to transmit over available transport.

4a. If the recipient of the aggregated message is MSGin5G UE, the MSGin5G Client 1 residing on the MSGin5G UE splits the received Aggregated message request into multiple individual MSGin5G message requests. The content of each MSGin5G message is delivered to the recipient Application Client(s).

NOTE 4: The delivery between MSGin5G Client and Application Client is out of scope of the present document.

4b. If the recipient of the aggregated message is the Message Gateway on behalf of Non-MSGin5G UE, the Message Gateway splits the received Aggregated message request into multiple individual MSGin5G message requests. The content of each MSGin5G message is delivered to the Non-MSGin5G UE via Non-MSGin5G message delivery.

NOTE 5: The Non-MSGin5G message delivery is out of scope of this document.

NOTE 6: The MSGin5G Server may aggregate messages towards the target UE if it receives messages from multiple MSGin5G UEs (instead of Application Server).

4c. If the recipient of the aggregated message is a Broadcast Area, the Broadcast Message Gateway split the received aggregated message request into multiple individual MSGin5G message requests. The Broadcast Message Gateway may either broadcast each individual MSGin5G message request to the MSGin5G UEs in the Broadcast Area, or broadcast the content of each individual MSGin5G message request to the non-MSGin5G UEs in the Broadcast Area, via CBCF. The procedures on CBCF are specified in 3GPP TS 23.041 [14].

8.5 MSGin5G Message Segmentation and Reassembly

8.5.1 General

This clause introduces MSGin5G message segmentation and reassembly functionality to the MSGin5G Service.

Segmentation and reassembly operations are performed by the MSGin5G Server, or by the MSGin5G Client, or by the Message Gateway, depending on the communication models. For Application-to-Point use case, the MSGin5G Server performs MSGin5G message segmentation while the MSGin5G Client performs MSGin5G message reassembly. For Point-to-Application use case, the MSGin5G Client performs MSGin5G message segmentation while the MSGin5G Server performs MSGin5G message reassembly. For the Point-to-Point use case the MSGin5G Client performs both the segmentation and the reassembly.

The Message Gateway performs segmentation and reassembly if the sender or the recipient is a non-MSGin5G UE.

The Aggregated message request should not be segmented. If aggregated message is sent to a recipient whose supported message segment size is smaller than the payload of aggregated message, the MSGin5G Server should handle the Aggregated message as specified in clause 8.4.2.

The maximum segmentation size of the payload of MSGin5G message is 2048 bytes and can be configurable. The supported segment size for an MSGin5G UE may be provided in the MSGin5G UE registration request.

8.5.2 Application-to-Point Segmentation and Reassembly

Figure 8.5.2-1 shows the MSGin5G message segmentation and reassembly procedure for Application-to-Point MSGin5G message use cases (e.g. AOMT).

NOTE 1: Segmentation can also be done by the Application Server, in this case the Application Server will create a segmented message and send it as a regular MSGin5G message. In this case it is implementation specific and out of the scope of the current specification.

Pre-conditions:

1. A UE hosts an MSGin5G Client and an Application Client.
2. The MSGin5G Client has registered with the MSGin5G Server.
3. An Application Server needs to deliver application data to the Application Client on the UE and the size of the application data exceeds the maximum allowed packet size (e.g. due to limitation by the UE's access network transport).
4. Both the Application Server and the MSGin5G UE are hosted by the same MSGin5G Server.

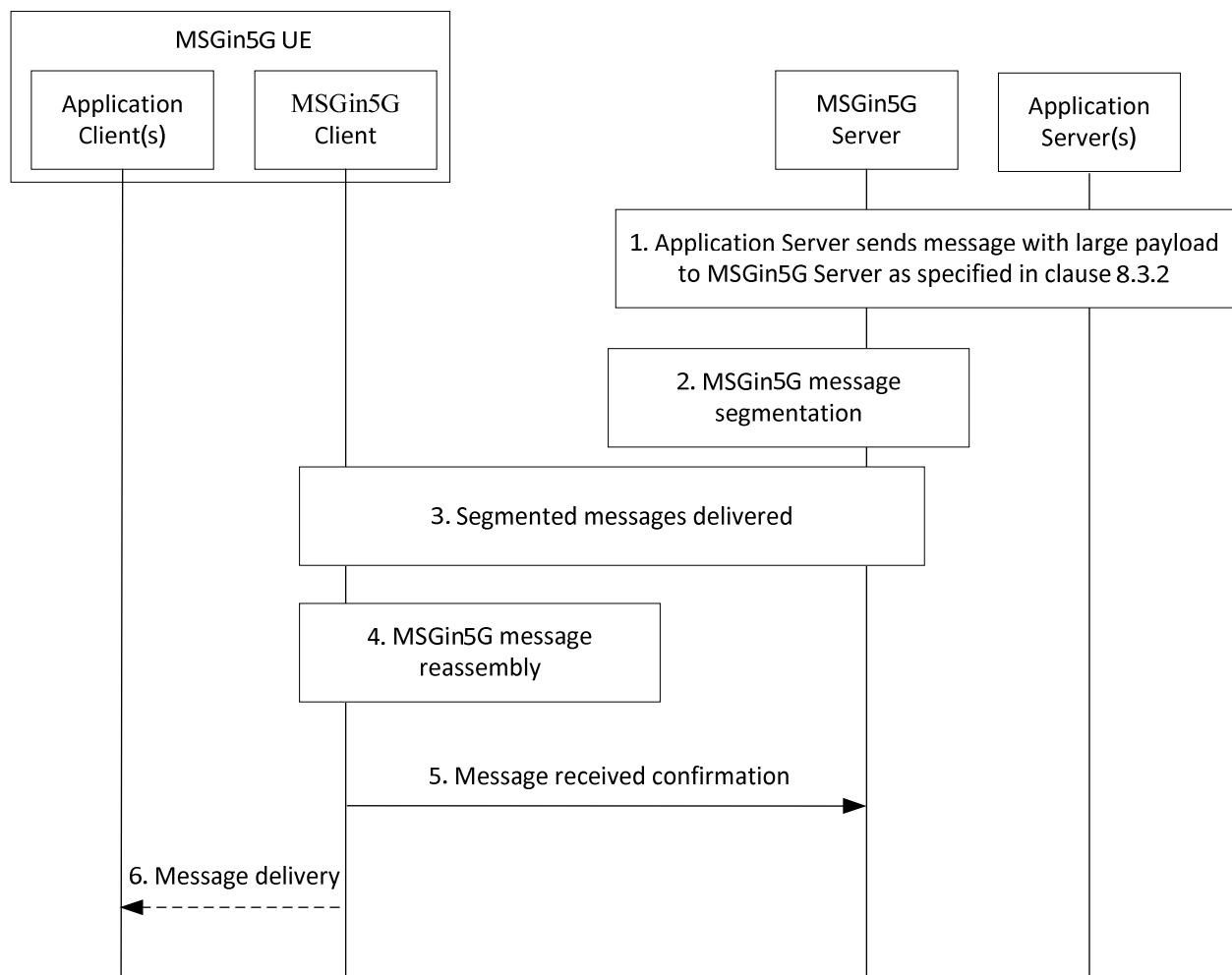


Figure 8.5.2-1: Application-to-Point MSGin5G Message Segmentation and Reassembly

1. An Application Server sends a message to an MSGin5G Server that targets an Application Client on a UE.
2. The MSGin5G Server compares the size of the payload of the received message to the Supported MSGin5G segment size of the targeted UE and detects that the size exceeds the limit. As a result, the MSGin5G Server segments the received message into a set of segmented messages. Within each segmented message, the information elements defined in Table 8.3.3-1 are included to enable the MSGin5G Client on the targeted UE to reassemble the segmented messages, with following clarifications.
 - a) The MSGin5G message request includes following information elements from Table 8.3.3-1:
 - i) Originating AS Service ID, Recipient UE Service ID, Message ID, Segmentation Set Identifier and Message segment number in each segmented message
 - ii) Delivery status required and Total number of message segments, only if it is the first segment of the message
 - iii) Last Segment Flag, only if it is the last segment of the message.
3. The MSGin5G Server sends each segmented message to the targeted UE. If any segment is not received within the expected time (based on configuration) then proceed to step 4.
4. If MSGin5G Client has received all segments (determined based on First segment and Last Segment), the MSGin5G Client reassembles all the segmented messages into a single MSGin5G message based on the information elements mentioned in step 2. If not all segments are received within expected time, then the MSGin5G Client recovers the segments as described in clause 8.5.6 MSGin5G message segment recovery procedure, before continuing with rest of the steps.

NOTE 2: When no further segments are received within expected time and if both first segment and last segment are missing, recovery can be initiated as described in clause 8.5.6 MSGin5G message segment recovery procedure for recovering the first segment and then for remaining segments.

5. The MSGin5G Client sends Message received confirmation request to the MSGin5G Server. The information elements defined in Table 8.5.2-2 are included in the request. The result information element will contain "success" if the reassembly of the segments is success. Otherwise, the result information element will contain "failure".

Table 8.5.2-2: Message Received Confirmation Request Information Elements

Information element	Status	Description
Segmentation Set Identifier	M	The Segmentation Set Identifier as received in segments.
Result	M	Indicates the "success" or "failure"

6. If reassembly of segments is successful, the MSGin5G Client delivers the contents of the MSGin5G message to the targeted Application Client. If MSGin5G Client has not received all messages (even after recovery procedure) or reassembly of segments failed for any reason (e.g. corrupt data) then the MSGin5G Client will notify receiving of a failed message to the Application Client.

8.5.3 Point-to-Application Message Segmentation and Reassembly

Figure 8.5.3-1 shows the MSGin5G message segmentation and reassembly procedure for Point-to-Application MSGin5G message use cases (e.g. MOAT).

Pre-conditions:

1. A UE hosts an MSGin5G Client and an Application Client.
2. The MSGin5G Client registered with the MSGin5G Server.
3. An Application Client on the UE needs to deliver application data to an Application Server and the size of the application data exceeds the maximum allowed packet size (e.g. due to limitation by the UE's access network transport).
4. Both the Application Server and the MSGin5G UE are hosted by the same MSGin5G Server.

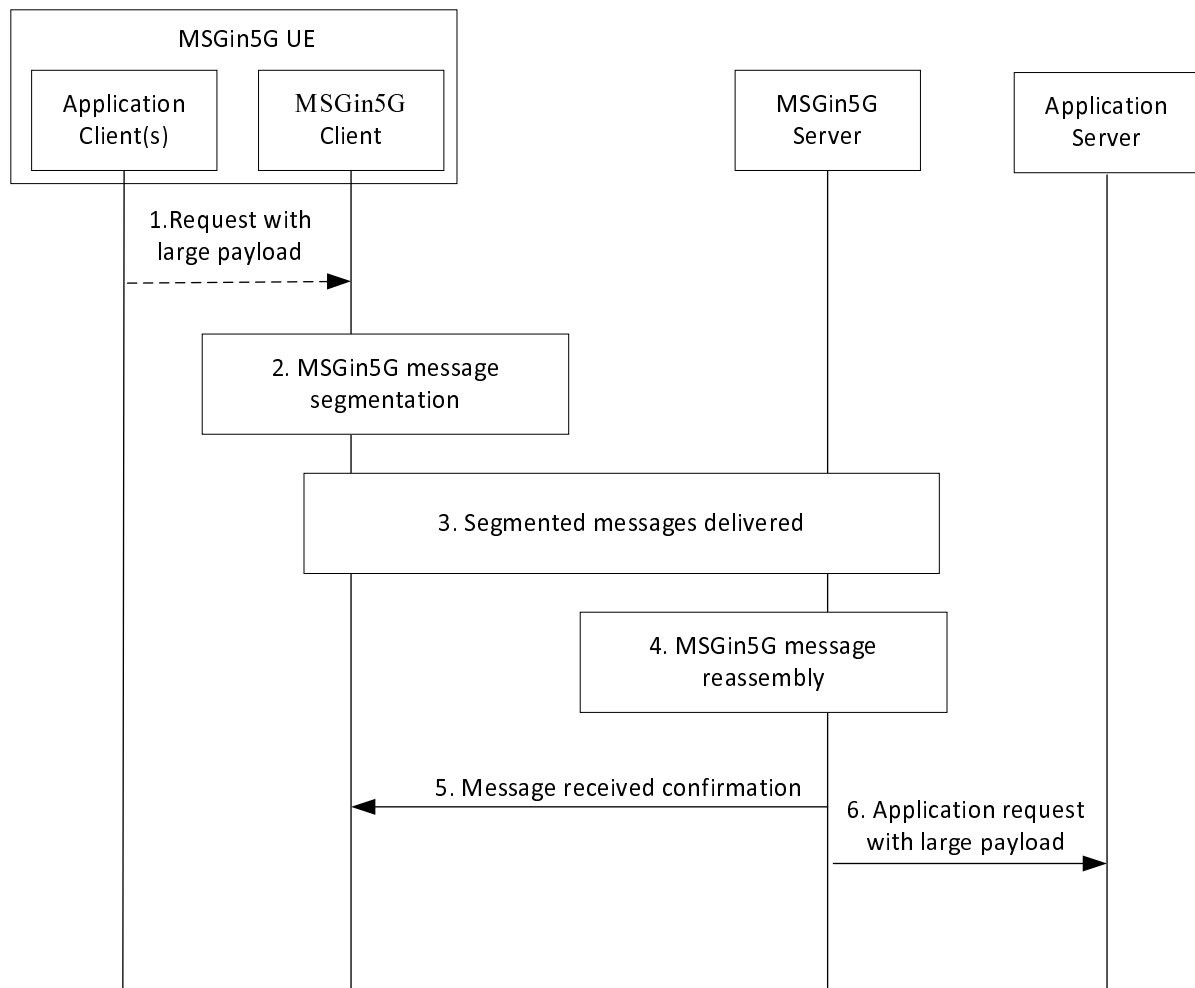


Figure 8.5.3-1: Point-to-Application MSGin5G Message Segmentation and Reassembly

1. An Application Client on a UE sends a message to an MSGin5G Client that targets an Application Server and that has a size that exceeds the maximum allowed packet size.
2. The MSGin5G Client compares the size of the payload of the received message to its Supported MSGin5G segment size for message delivery to the MSGin5G Server and detects that the size exceeds the limit. As a result, the MSGin5G Client segments the received message into a set of segmented messages such that each segmented message can fit within the Supported MSGin5G segment size. Within each segmented message, the information elements defined in Table 8.3.2-1 are included to enable the MSGin5G Server to reassemble the segmented messages, with following clarifications.
 - a) The MSGin5G message request includes following information elements from Table 8.3.2-1:
 - i) Originating UE Service ID, Recipient AS Service ID, Message ID, Segmentation set identifier and Message segment number in each segmented message
 - ii) Delivery status required and Total number of message segments, only if it is the first segment of the message
 - iii) Last segment flag, only if it is the last segment of the message.
3. The MSGin5G Client sends each segmented message to the MSGin5G Server. If any segment is not received within the expected time (based on configuration) then proceed to step 4.
4. If MSGin5G Server has received all segments (determined based on first segment and last Segment), the MSGin5G Server reassembles all the segmented messages into a single MSGin5G message based on the information elements mentioned in step 2. If not all segments are received within expected time, then the MSGin5G Server recovers the segments as described in clause 8.5.6 MSGin5G message segment recovery procedure, before continuing with rest of the steps.

NOTE 1: When no further segments are received within expected time and if both first segment and last segment are missing, recovery can be initiated as described in clause 8.5.6 MSGin5G message segment recovery procedure for recovering the first segment and then for remaining segments.

5. The MSGin5G Server sends a Message received confirmation to the MSGin5G Client. The information elements defined in Table 8.3.2-3 are included in the request.
6. If reassembly of segments is successful, the MSGin5G Server delivers the contents of the MSGin5G message to the targeted Application Server. If MSGin5G Server has not received all messages (even after recovery procedure) or reassembly of segments failed for any reason (e.g. corrupt data) then the MSGin5G Server will notify receiving of a failed message to the Application Server.

8.5.4 Point-to-Point Message Segmentation and Reassembly

Figure 8.5.4-1 shows the MSGin5G message segmentation and reassembly procedure for Point-to-Point MSGin5G message use cases (e.g. MOMT).

If the recipient UE is a non-MSGin5G UE, the reassembly is performed by the Message Gateway.

This procedure assumes that a UE is only aware of the maximum payload size of the delivery mechanism it is currently using, and it is not aware of the maximum payload size of the recipient UE.

Pre-conditions:

1. Both UEs host an MSGin5G Client and an Application Client.
2. The MSGin5G Clients registered with the MSGin5G Server.
3. An Application Client on the UE needs to deliver application data to an Application Client on another UE and the size of the application data exceeds the allowed maximum packet size (e.g. due to limitation by the UE's access network transport).
4. Both the sending and the receiving MSGin5G UE are hosted by the same MSGin5G Server.

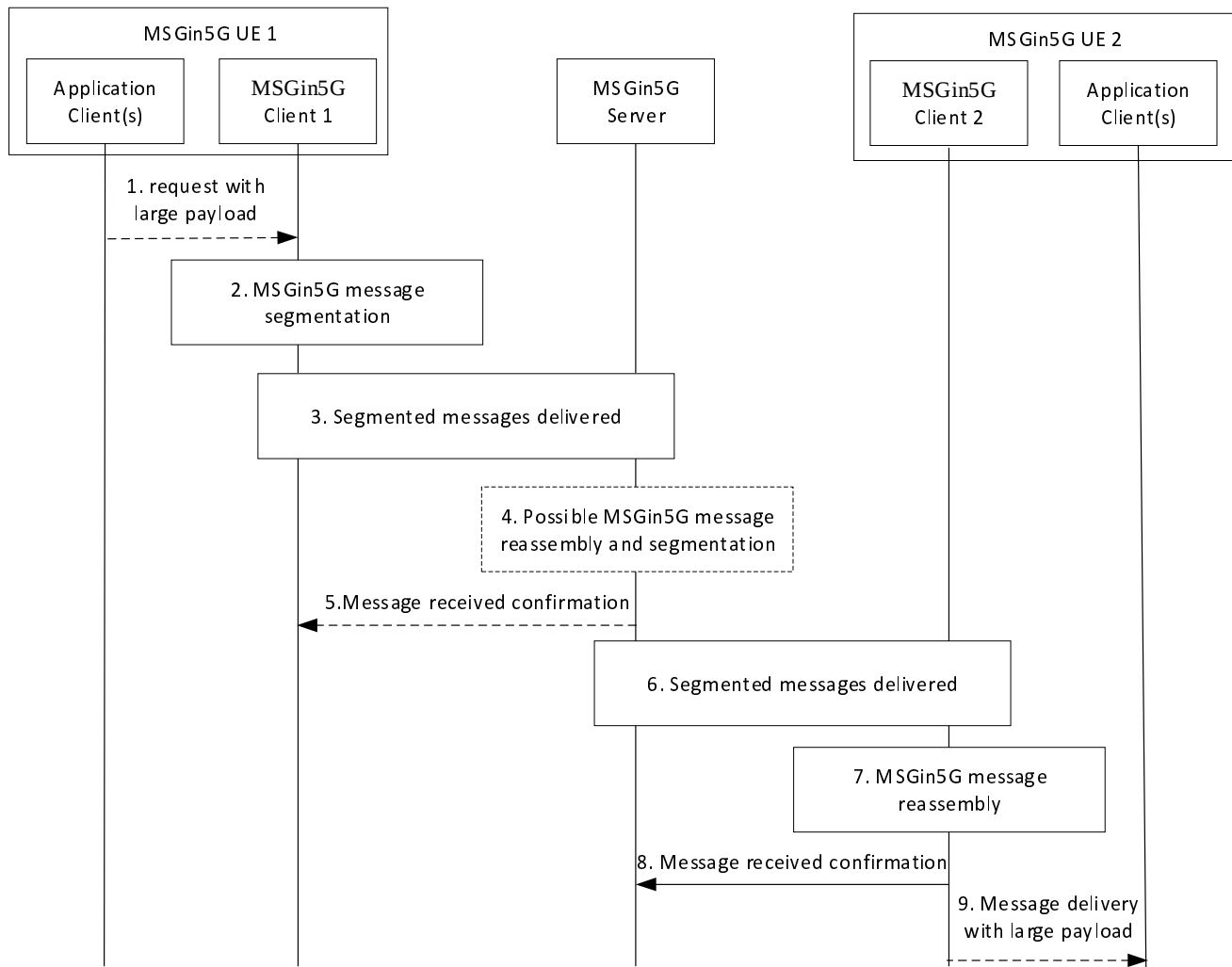


Figure 8.5.4-1: Point-to-Point MSGin5G Message Segmentation and Reassembly

1. An Application Client on UE 1 sends a message to MSGin5G Client 1 that targets Application Client on UE 2.
2. The MSGin5G Client 1 compares the size of payload of the received message to its Supported MSGin5G segment size for message delivery to the MSGin5G Server and detects that the size exceeds the limit of the originating UE. As a result, the MSGin5G Client segments the received message into a set of segmented messages such that each segmented message can fit within the Supported MSGin5G segment size.

The MSGin5G message request includes following information elements from Table 8.3.2-1:

- i) Originating UE Service ID, Recipient UE Service ID, Message ID, Segmentation set identifier and Message segment number in each segmented message
 - ii) Delivery status required and Total number of message segments, only if it is the first segment of the message
 - iii) Last segment flag, only if it is the last segment of the message.
3. The MSGin5G Client 1 sends each segmented message to the MSGin5G Server. If any segment is not received within the expected time (based on configuration) then proceed to step 5.
 4. The MSGin5G Server checks if each segment does not exceed the configured maximum packet size of the targeted UE. If the maximum packet size is not exceeded, then the MSGin5G Server proceeds with step 6.

If the maximum packet size is exceeded, the MSGin5G Server performs the following operations:

- a) If all segments are received within expected time, then the MSGin5G Server reassembles subsequent segmented messages into a single MSGin5G message until the Last segment flag indication is received. The re-assembled message is then segmented such that each segment is smaller than the maximum allowed packet size of the targeted UE. Within each segmented message, the information elements as mentioned in step 2 are included to enable reassembly at the target, then proceed with step 6.
 - b) If not all segments are received within expected time, then the MSGin5G Server acts as Message Receiver to recover the segments as described in clause 8.5.6 MSGin5G message segment recovery procedure, before continuing with rest of the steps. If all segments are received after recovery procedure, then the MSGin5G Server skips to step 4-a, otherwise proceed to step 5.
5. The MSGin5G Server sends Message received confirmation to the MSGin5G Client 1. The information elements defined in Table 8.3.2-3 are included in the request. If the Result information element is "failure" further steps are not executed.
 6. The MSGin5G Server sends each segmented message to the MSGin5G Client 2. If any segment as a separate message is not received within the expected time (based on configuration) then proceed to step 8.
 7. The MSGin5G Client 2 reassembles all the segmented messages into a single MSGin5G message based on the information elements defined mentioned in step 2. If not all segments are received within expected time, then the MSGin5G Client 2 acts as Message receiver to recover the segments as described in clause 8.5.6 MSGin5G message segment recovery procedure, before continuing with rest of the steps.
- NOTE 1: Steps 7, 8 and 9 can also be performed by the MSGin5G Client functionality in the Message Gateway in case the recipient UE is a non-MSGin5G UE.
8. The MSGin5G Client 2 sends Message received confirmation to the MSGin5G Server. The information elements defined in Table 8.5.2-2 are included in the request. The Result information element will contain "success" if the reassembly of the segments is successful. Otherwise, the Result information element will contain "failure".
 9. The MSGin5G Client 2 delivers the contents of the MSGin5G message to the targeted Application Client. If MSGin5G Client has not received all messages (even after recovery procedure) or reassembly of segments failed for any reason (e.g. corrupt data) then the MSGin5G Client will notify receiving of failed message to Application Client.

8.5.5 Group Message Segmentation and Reassembly

A Group Message is sent from the MSGin5G Server to a group of recipient UEs. The MSGin5G Server sends the message to each individual recipient taking into account the Supported MSGin5G segment size of each recipient and segments the message as described in clause 8.5.4.

8.5.6 MSGin5G Message Segment Recovery

Figure 8.5.6-1 illustrates an MSGin5G message segmentation recovery procedure. The procedure is applicable to Application-to-Point messages, Point-to-Application messages, Point-to-Point message and Group messages.

Pre-conditions:

1. The Message sender has delivered segmented messages to Message receiver.

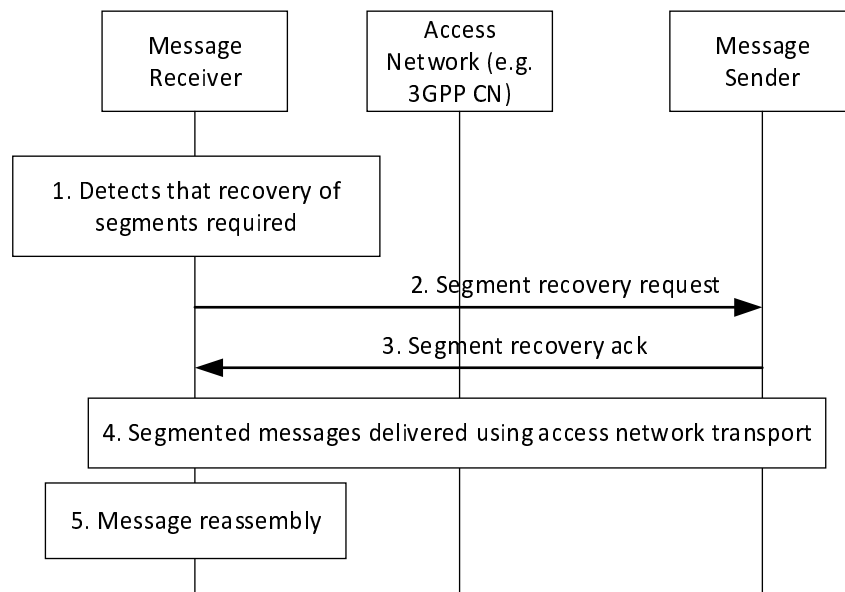


Figure 8.5.6-1: MSGin5G Message Segmentation and Reassembly

1. The Message Receiver detects that few segments are missing to reassemble complete message.
2. The Message receiver sends Segment recovery request to Message sender. The information elements defined in Table 8.5.6-1 are included in the request message.

Table 8.5.6-1: Segment Recovery Request Information Elements

Information element	Status	Description
Segmentation Set Identifier	M	The Segmentation Set Identifier as received in segments.
List of Segment range	M	List of Segment range which the client wants to recover, each segment range consist of start and end sequence number of missing segments e.g. (5-7, 10-10, 15-19)

3. The Message sender sends Segment recovery acknowledgement to the MSGin5G Receiver.
4. The Message sender sends each segmented message to the Message receiver within an individual access network transport packet. If any segment is not received within the expected time (based on configuration) then the Message receiver may consider as recovery failed or may initiate the procedure again with updated list of segment range.

NOTE: The MSGin5G message segment recovery procedure may repeat based on the configuration.

5. If Message receiver has received all segments (determined based on First segment and Last Segment), the Message receiver reassembles all the segmented messages into a single MSGin5G message.

8.6 MSGin5G messaging procedure on Message Gateway

8.6.1 General MSGin5G messaging procedure on Message Gateway

Figure 8.6.1-1 shows the MSGin5G message delivery procedure on Message Gateway for Non-MSGin5G UEs.

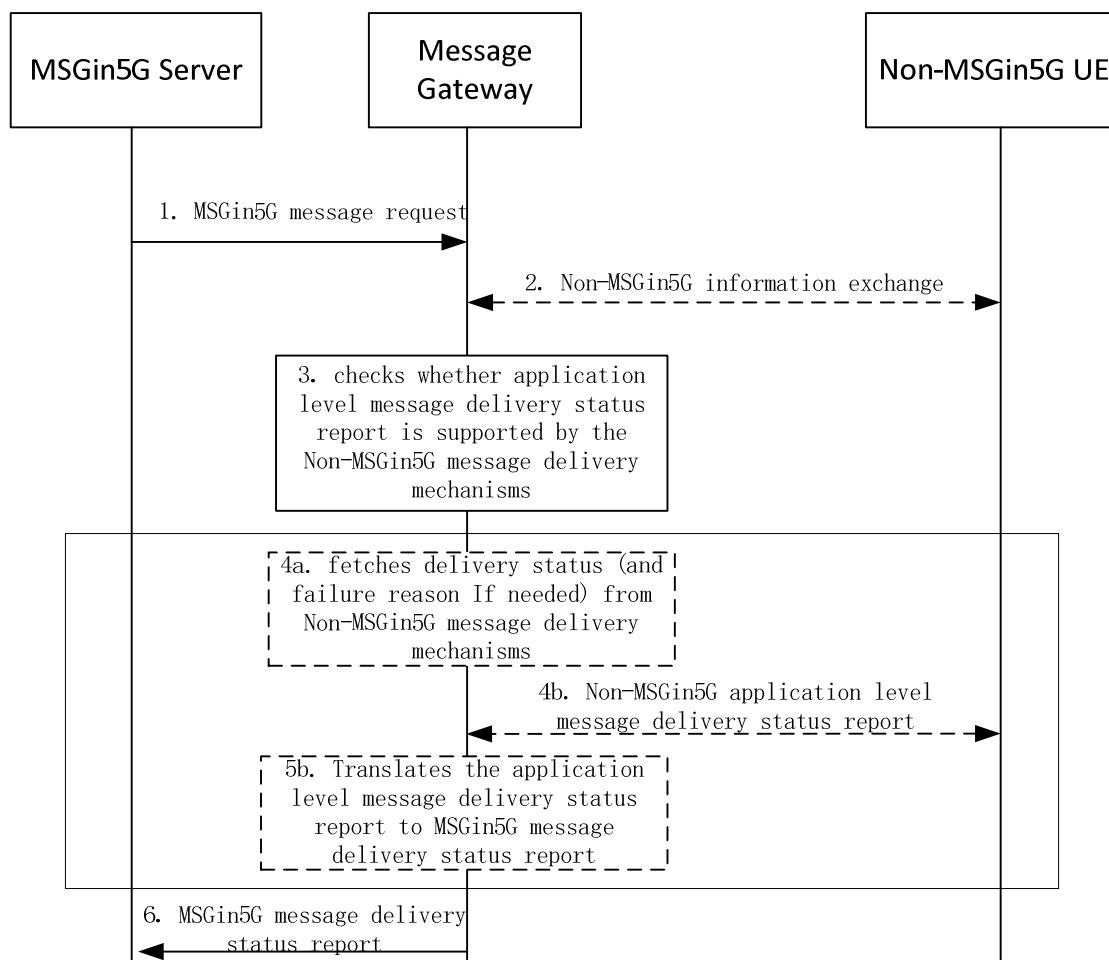


Figure 8.6.1-1: MSGin5G messaging procedure on Message Gateway.

1. The MSGin5G Server forwards the MSGin5G message request to recipient Non-MSGin5G UE based on the UE Service ID or to the Broadcast Message Gateway based on the Broadcast Area ID as specified in clause 8.3.3. A Delivery status required IE may be included in the MSGin5G message request.
2. The Message Gateway records if a message delivery status report is requested in the message. Then it translates the MSGin5G message to a Non-MSGin5G message (e.g. SMS, RCS message as specified in GSMA PRD RCC.07 [3]) with message delivery status report requested and finishes the information exchange procedure with Non-MSGin5G UE (e.g. sends the non-MSGin5G message to the Non-MSGin5G UE and receives the needed response).

NOTE 1: The information exchange procedure between Message Gateway and Non-MSGin5G UE is out of scope of this specification.

3. The Message Gateway checks if application level message delivery status report is supported by the Non-MSGin5G message delivery mechanism. If not supported, step 4a will be used and steps 4b and 5b will be skipped; otherwise step 4b-5b will be used and step 4a will be skipped.
- 4a. Based on the information (e.g. response to the non-MSGin5G message delivery request, transport level information) obtained from the non-MSGin5G message delivery mechanism, the Message Gateway fetches the delivery status from the above information and uses it to create an MSGin5G message delivery status report. If the delivery status is a failure, the Message Gateway also fetches the suitable failure reason from the above information and uses it as reason of failure in the MSGin5G message delivery status report. The Information Elements listed in table 8.3.4-1 are included in the MSGin5G message delivery status report.

- 4b. A non-MSGin5G application level message delivery status report is received by the Message Gateway.

NOTE 2: The procedure of non-MSGin5G application level message delivery status report is out of scope of this specification.

- 5b. The Message Gateway translates the non-MSGin5G application level message delivery status report to MSGin5G message delivery status report as specified in clause 8.3.4. The Information Elements listed in table 8.3.4-1 are also included in this MSGin5G message delivery status report, but the Delivery Status and Failure Cause IEs are fetched from the non-MSGin5G application level message delivery status report.
6. The Message Gateway sends the MSGin5G message delivery status report to the MSGin5G Server on behalf of the Non-MSGin5G UE or based on the delivery result of the broadcast delivery mechanism, as specified in clause 8.3.4.

NOTE: The Broadcast Message Gateway could provide the delivery status report. If the recipient UE supports an MSGin5G Client, the MSGin5G UE can (also) send a delivery status report.

8.6.2 Non-MSGin5G UE receives message from group

8.6.2.1 Legacy 3GPP UE receives message from group

Figure 8.6.2.1-1 shows the procedure for Legacy 3GPP UE to receive message from group.

Pre-conditions:

1. The MSGin5G Server has received the Group message to be sent to a target Legacy 3GPP UE.

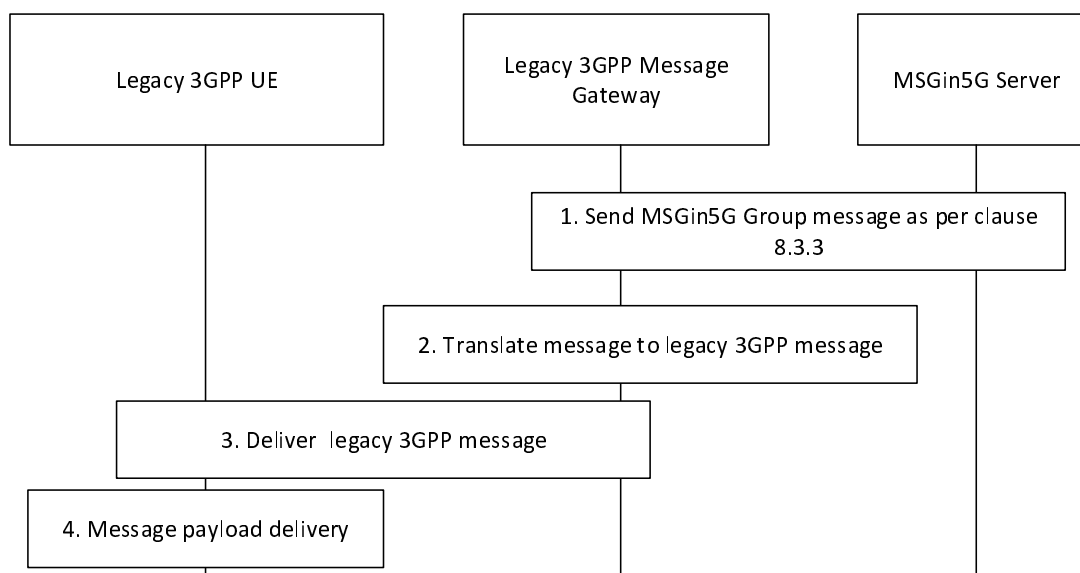


Figure 8.6.2.1-1: Legacy 3GPP UE receives a message from a group

1. The MSGin5G Server sends the MSGin5G message request to the recipient based on the UE Service ID. The Legacy 3GPP Message Gateway receives the MSGin5G message request on behalf of the Legacy 3GPP UE as defined in clause 8.3.3 with following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient Group Service ID, Recipient UE Service ID, Message ID, Payload information elements from Table 8.3.3-1. The MSGin5G message request may include Delivery status required, Application ID and Priority type information elements from Table 8.3.3-1.
2. The Legacy 3GPP Message Gateway translates the MSGin5G message request to Legacy 3GPP message (e.g. SMS).
3. The Legacy 3GPP message gateway sends the Legacy 3GPP message (e.g. SMS) to Legacy 3GPP UE.
4. The Legacy 3GPP UE delivers the payload of the legacy 3GPP message (e.g. SMS) to the targeted Application Client on the Legacy 3GPP UE.

8.6.2.2 Non-3GPP message client receives message from group

Figure 8.6.2.2-1 shows the procedure for Non-3GPP message client to receive message from group.

Pre-conditions:

1. The MSGin5G Server has received the Group message to be sent to target Non-3GPP UE.

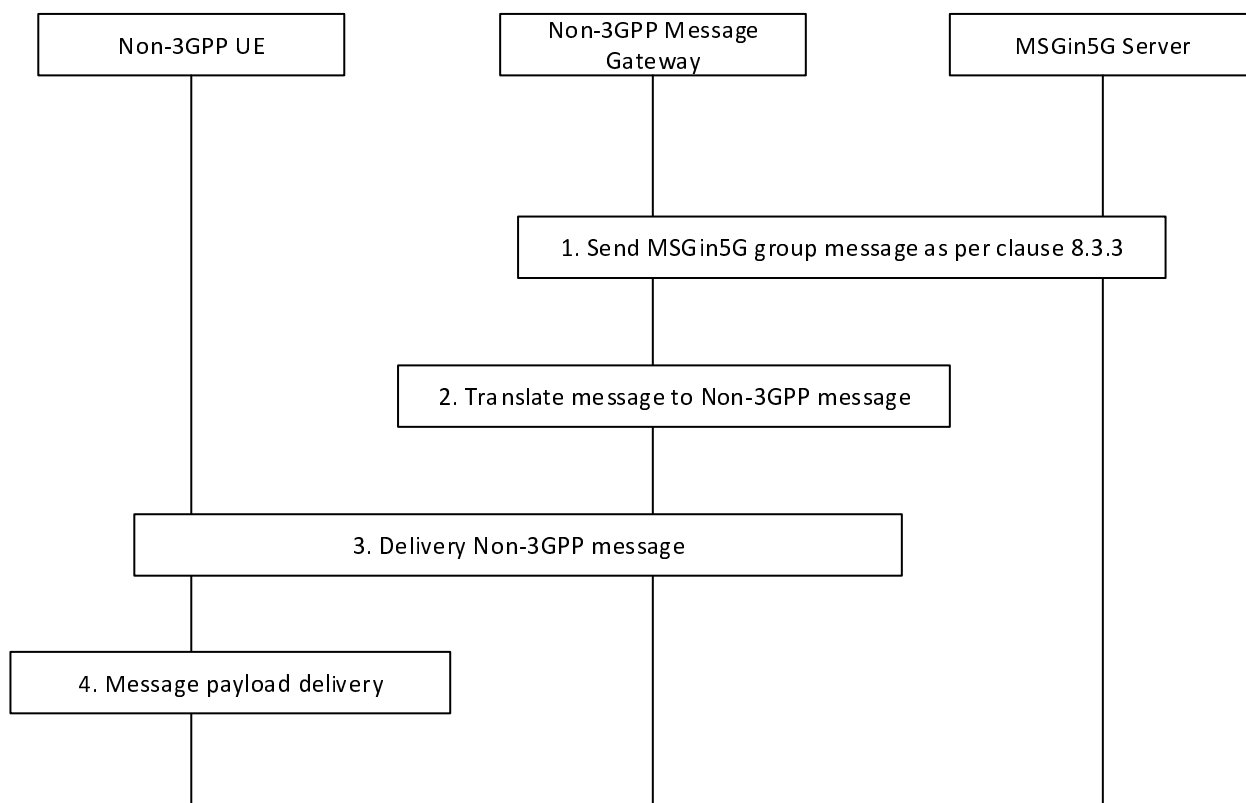


Figure 8.6.2.2-1: Non-3GPP message client receives a message from a group

1. The MSGin5G Server sends the MSGin5G message request to the recipient based on the UE Service ID. The MSGin5G Gateway receives the MSGin5G message request on behalf of the Non-3GPP UE as defined in clause 8.3.3 with following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient Group Service ID, Recipient UE Service ID, Message ID, Payload information elements from Table 8.3.3-1. The MSGin5G message request may include Delivery status required, Application ID and Priority type information elements from Table 8.3.3-1.
2. The Non-3GPP Message Gateway translates the MSGin5G message to Non-3GPP message.
3. The Non-3GPP Message Gateway sends message to Non-3GPP Message Client.
- 4) The Non-3GPP UE delivers the payload of the non-3GPP message (e.g. RCS) to the targeted Application Client on the Non-3GPP UE.

NOTE: The procedure to translate an MSGin5G message to a Non-3GPP message and to send a Non-3GPP message from the Non-3GPP Message Gateway to the Non-3GPP Message Client are out of scope of 3GPP.

8.7 E2E Message delivery procedures

8.7.1 Point-to-Point Message delivery procedures

8.7.1.1 From MSGin5G UE to MSGin5G UE

Figure 8.7.1.1-1 shows the message delivery procedure from MSGin5G UE 1 to MSGin5G UE 2.

Pre-condition:

- Both MSGin5G Client 1 in MSGin5G UE 1 and MSGin5G Client 2 in MSGin5G UE 2 have registered with the MSGin5G Server.

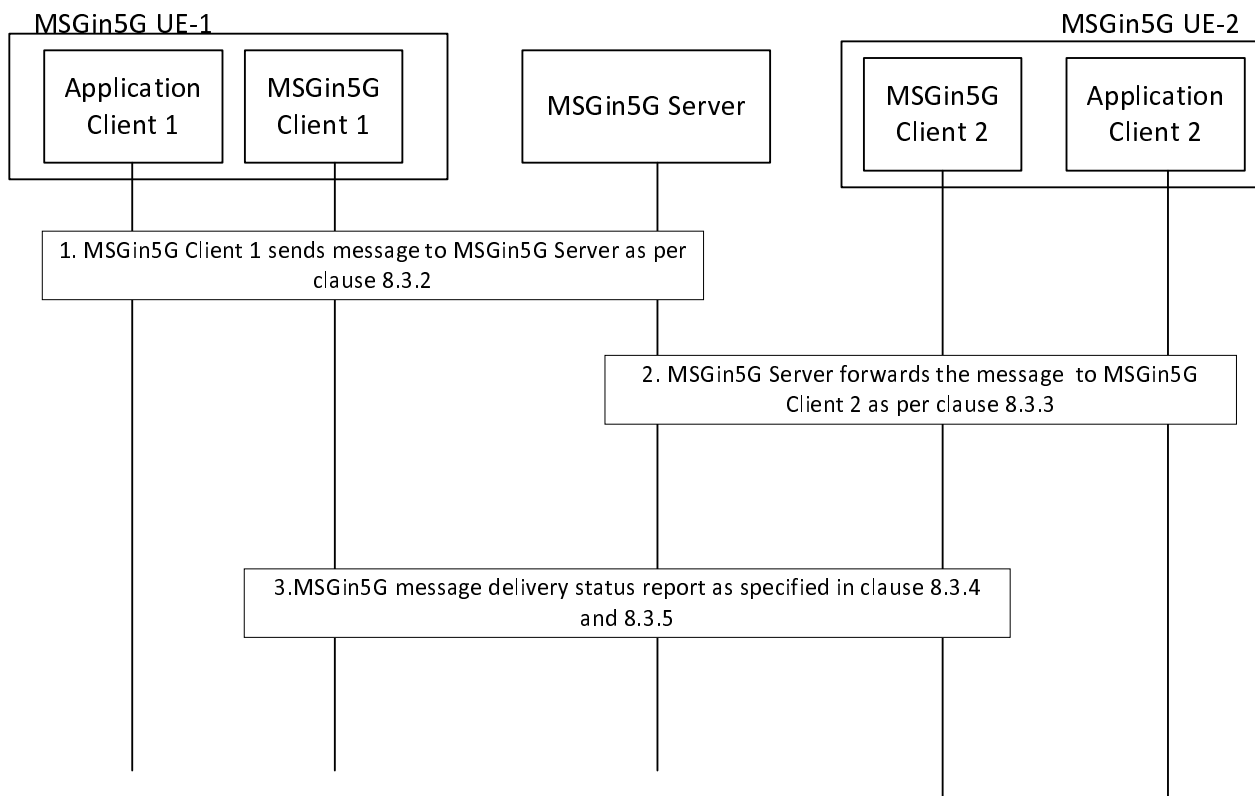


Figure 8.7.1.1-1 Message delivery between MSGin5G UEs

- The MSGin5G Client 1 sends an MSGin5G message request to MSGin5G Server as specified in clause 8.3.2 with following clarifications:
 - The MSGin5G message request includes Originating UE Service ID, Recipient UE Service ID and Message ID information elements in Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
 - Upon receiving the MSGin5G message request, the MSGin5G Server determines if the MSGin5G Client 1 is authorized to send a message to MSGin5G Client 2.
- The MSGin5G Server forwards the MSGin5G message request to MSGin5G Client 2 as specified in clause 8.3.3.
- If Delivery status required is included in the MSGin5G message request, MSGin5G Client 2 sends MSGin5G message delivery status report to the MSGin5G Server as specified in clause 8.3.4 and then the MSGin5G Server sends MSGin5G message delivery status report to MSGin5G Client 1 as specified in clause 8.3.5.

8.7.1.2 From MSGin5G UE to Legacy 3GPP UE

Figure 8.7.1.2-1 shows the message delivery procedure from MSGin5G UE to Legacy 3GPP UE.

Pre-conditions:

1. MSGin5G Client in MSGin5G UE has registered with the MSGin5G Server and the Message Gateway has registered with the MSGin5G Server on behalf of the Legacy 3GPP UE.
2. Legacy 3GPP Message Gateway is aware of the UE Service ID of Legacy 3GPP UE and maintains the mapping to IDs used in the legacy network.

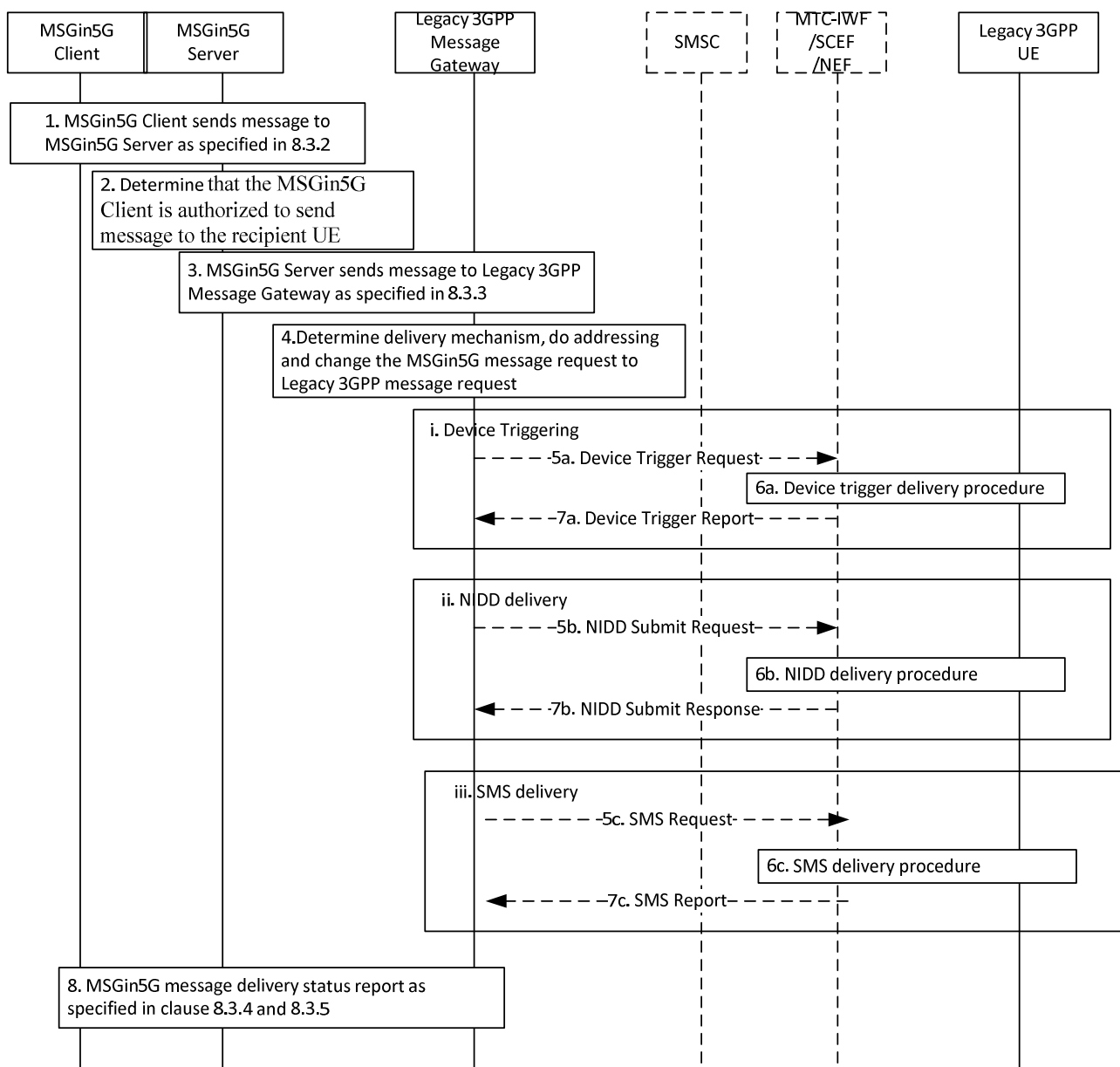


Figure 8.7.1.2-1: Message delivery from MSGin5G UE to Legacy 3GPP UE

1. The MSGin5G Client sends an MSGin5G message request to the MSGin5G Server as specified in clause 8.3.2 with following clarifications:

- a) The MSGin5G message request includes Originating UE Service ID, Recipient UE Service ID and Message ID information elements in Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
2. Upon receiving the MSGin5G message request, the MSGin5G Server determines if the MSGin5G Client is authorized to send a message to the recipient UE.
3. The MSGin5G Server forwards the MSGin5G message request to the recipient based on the UE Service ID. The Legacy 3GPP Gateway receives the MSGin5G message request on behalf of the Legacy 3GPP UE as specified in 8.3.3.
4. The Legacy 3GPP Message Gateway determines which legacy 3GPP message delivery mechanism (e.g. SMS, NIDD, Device triggering) will be used based on Legacy 3GPP UE capability, the UE communication status, and the MSGin5G Service configuration. When selected, the Legacy 3GPP Message Gateway maps the UE Service ID to the corresponding identifier. For example (not an exhaustive list):
 - a) if the Legacy 3GPP Message Gateway selected the device triggering delivery mechanism, it maps the UE Service ID to MSISDN and Application port ID
 - b) if the Legacy 3GPP Message Gateway selected the NIDD delivery mechanism, it maps the UE Service ID to External Identifier or MSISDN.
 - c) if the Legacy 3GPP Message Gateway selected the SMS delivery mechanism, it maps the UE Service ID to MSISDN.
- 5-7. The Legacy 3GPP Message Gateway sends the payload of the MSGin5G message to the terminating Legacy 3GPP UE using the determined delivery mechanism. For example:
 - a) For Device triggering delivery mechanism, the Legacy 3GPP Message Gateway interacts with the MTC-IWF/SCEF/NEF and maps the payload of the MSGin5G message to one or more Device Triggering requests. The MTC-IWF/SCEF/NEF interacts with SMS-SC for delivery to the UE and to receive the message delivery status report (see TS 23.682 [8] clause 5.2, TS 29.122 [9] clause 4.4.6 and TS 29.522 [10] clause 4.4.3)
 - b) For NIDD delivery mechanism, the Legacy 3GPP Message Gateway may interact with the SCEF/NEF and maps the payload of the MSGin5G message to one or more NIDD submit request messages. The Reliable Data Service Configuration, Maximum Latency, Priority, PDN Connection Establishment Option settings are based on pre-configurations (see TS 23.682 [8] clause 5.13, TS 29.122 [9] clause 4.4.5.3 and TS 29.522 [10] clause 4.4.12.3). Alternatively, if tunnel parameters are provisioned in the Legacy 3GPP Message Gateway and UPF/P-GW the payload could be tunnelled via the UPF/P-GW (see TS 23.401 [11] (clause 4.3.17.8.3.3), TS 23.501[12] clause 5.6.10.3, TS 23.502 [7] clause 4.24);
 - c) For SMS delivery mechanism, the Legacy 3GPP Message Gateway sends SMS to the Legacy 3GPP UE through the SMSC according to the procedure in TS 23.204 [13] or the procedure in clause 4.13.3 of TS 23.502 [7].
8. If Delivery status required is included in the MSGin5G message request, the Legacy 3GPP Message Gateway sends the MSGin5G message delivery status report to the MSGin5G Server as specified in clause 8.3.4 and then the MSGin5G Server sends the message delivery status report to the MSGin5G Client as specified in clause 8.3.5.

8.7.1.3 From MSGin5G UE to Non-3GPP UE

Figure 8.7.1.3-1 shows the message delivery procedure from MSGin5G UE to Non-3GPP UE.

Pre-conditions:

1. MSGin5G Client in MSGin5G UE has registered with the MSGin5G Server and the Non-3GPP Message Gateway has registered with the MSGin5G Server on behalf of the Non-3GPP UE.
2. Non-3GPP Message Gateway is aware of the non-3GPP message client in Non-3GPP UE and provides the mapping to UE Service ID.

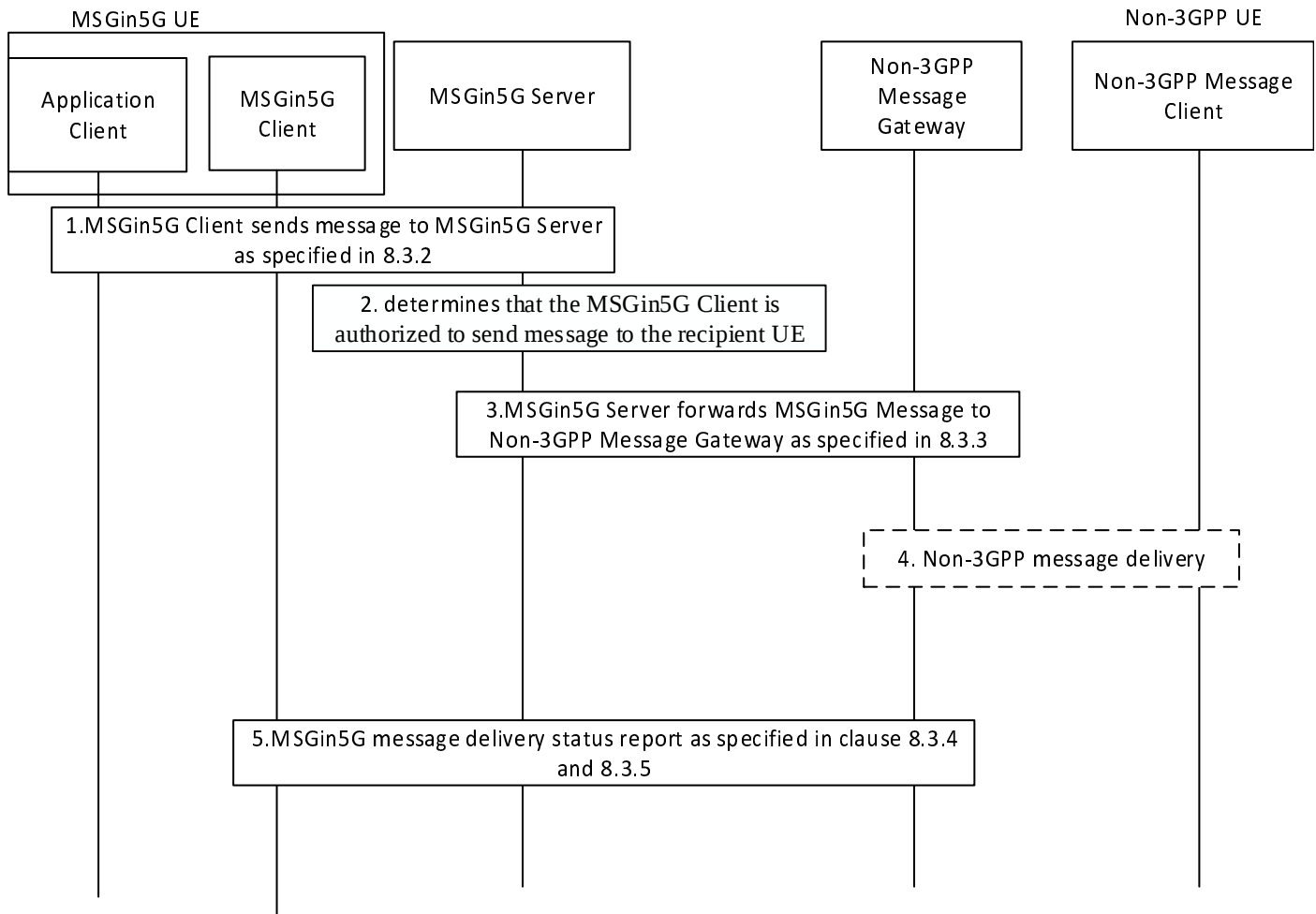


Figure 8.7.1.3-1 Message Delivery from MSGin5G UE to Non-3GPP UE

1. The Application Client in the MSGin5G UE triggers the MSGin5G Client to send an MSGin5G message request to the MSGin5G Server as specified in 8.3.2 with following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient UE Service ID and Message ID information elements in Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
2. The MSGin5G Server determines if the MSGin5G Client is authorized to send a message to the recipient UE.
3. The MSGin5G Server forwards the MSGin5G message request to the recipient based on the UE Service ID. The Non-3GPP Message Gateway receives the MSGin5G message request on behalf of the Non-3GPP UE as specified in clause 8.6.1.
4. The Non-3GPP Message Gateway translates the MSGin5G message to the Non-3GPP message with message delivery status report, if appropriate, requested and sends it to the Non-3GPP Message Client. This step is outside the scope of the present specification.
5. If message delivery status report is requested, the Non-3GPP Message Gateway sends the MSGin5G message delivery status report to the MSGin5G Server as specified in clause 8.3.4, the MSGin5G Server forwards the MSGin5G message delivery status report to the MSGin5G Client as specified in clause 8.3.5.

8.7.1.4 From Legacy 3GPP UE to MSGin5G UE

This procedure is used for message reply from Legacy 3GPP UE (e.g. SMS UE) to MSGin5G UE.

Figure 8.7.1.4-1 shows the response message delivery procedure from Legacy 3GPP UE (e.g. SMS UE) to MSGin5G UE.

Pre-conditions:

1. MSGin5G Client in MSGin5G UE has registered with the MSGin5G Server and the Legacy 3GPP Message Gateway has registered with the MSGin5G Server on behalf of the Legacy 3GPP UE.
2. The Legacy 3GPP UE received a message from the MSGin5G UE.
3. The Legacy 3GPP Message Gateway is aware of the Legacy 3GPP UE and provides the mapping to UE Service ID.
4. The Legacy 3GPP UE replies to the MSGin5G UE upon receiving the message from the MSGin5G UE.
5. The Legacy 3GPP Message Gateway implementation supports storing a messaging transaction, i.e. mapping the message originating MSGin5G Service ID and the message delivered to the Legacy 3GPP UE, for an operator configured time period to allow if the Legacy 3GPP UE will send a response to the incoming message.

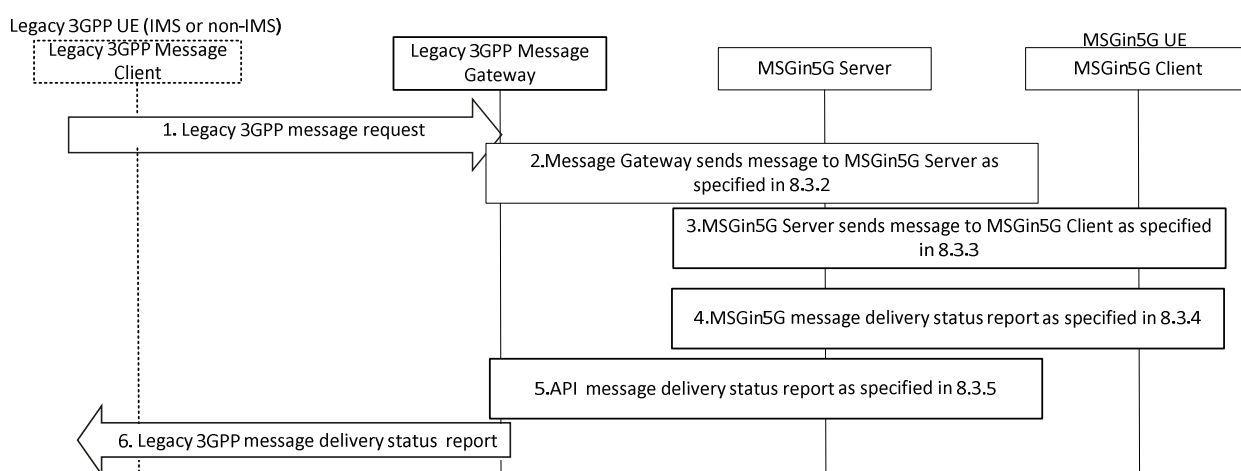


Figure 8.7.1.4-1: Legacy 3GPPs UE replies to MSGin5G UE

1. The Legacy 3GPP UE sends a Legacy 3GPP message request to the Legacy 3GPP Message Gateway (e.g. through SMSC if SMS is used according the procedure in 3GPP TS 23.204 [13] or the procedure in clause 4.13.3 of TS 23.502 [7]).
2. The Legacy 3GPP Message Gateway translates the SMS message into MSGin5G message and sends an MSGin5G message request to the MSGin5G Server as specified in clause 8.3.2 with the following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient UE Service ID, and Message ID information elements in Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
 - b) Upon receiving the MSGin5G message request, the MSGin5G Server determines if the Legacy 3GPP UE with its UE Service ID is allowed to send a message to the MSGin5G UE.
3. The MSGin5G Server forwards the MSGin5G message request to the target MSGin5G Client as specified in clause 8.3.3.
- 4-6. If the message delivery status report is requested, the MSGin5G Client in MSGin5G UE sends an MSGin5G message delivery status report to the MSGin5G Server as specified in clause 8.3.4, the MSGin5G Server sends the MSGin5G message delivery status report to the Legacy 3GPP Message Gateway specified in clause 8.3.5, the Legacy 3GPP Message Gateway translates the MSGin5G message delivery status report to a Legacy 3GPP message delivery status report and sends it to the Legacy 3GPP UE.

8.7.1.5 From Non-3GPP UE to MSGin5G UE

This procedure is used for message reply from Non-3GPP UE to MSGin5G UE.

Figure 8.7.1.5-1 shows the message delivery procedure from Non-3GPP UE to MSGin5G UE.

Pre-conditions:

1. MSGin5G Client in MSGin5G UE has registered with the MSGin5G Server and the Non-3GPP Message Gateway has registered with the MSGin5G Server on behalf of the Non-3GPP UE.
2. The Non-3GPP UE received a message from the MSGin5G UE.
3. The Non-3GPP Message Gateway is aware of the Non-3GPP message client on the Non-3GPP UE and provides the mapping to UE Service ID.
4. The Non-3GPP UE replies to the MSGin5G UE upon receiving the message from the MSGin5G UE.
5. The Non-3GPP Message Gateway implementation supports storing a messaging transaction, i.e. mapping the message originating MSGin5G Service ID and the message delivered to the Non-3GPP UE, for an operator configured time period to allow if the Non-3GPP UE will send a response to the incoming message.

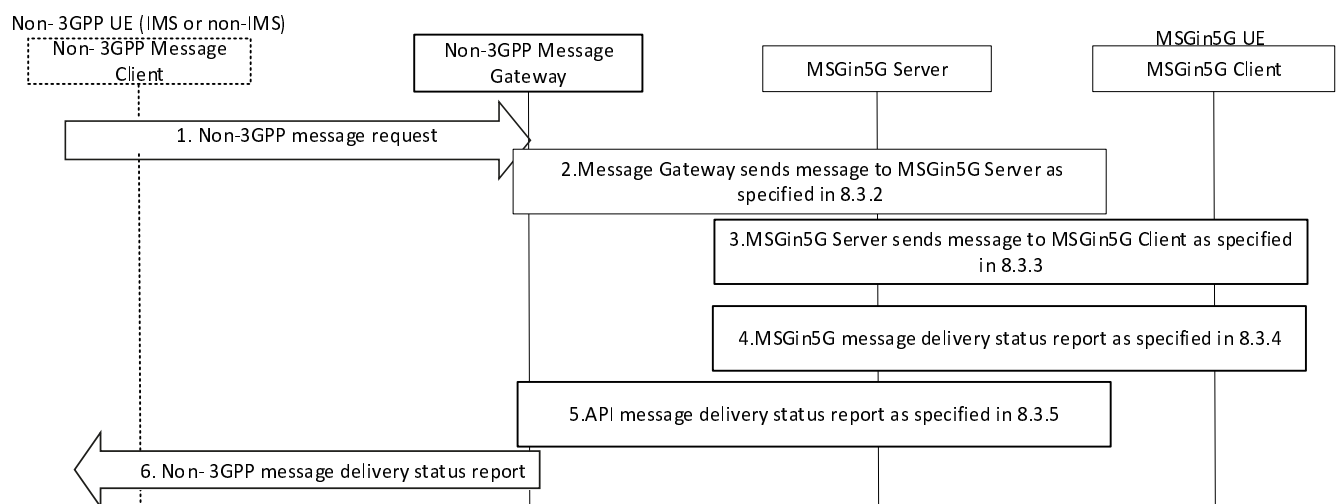


Figure 8.7.1.5-1: Non-3GPP UE replies to MSGin5G UE

1. The Non-3GPP UE sends a Non-3GPP message request to the Non-3GPP Message Gateway.
2. The Non-3GPP Message Gateway translates the Non-3GPP message to MSGin5G message with message delivery status report requested and sends an MSGin5G message request to the MSGin5G Server as specified in clause 8.3.2 with the following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient UE Service ID and Message ID information elements in Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
 - b) Upon receiving the MSGin5G message request, the MSGin5G Server determines if the Non-3GPP UE with its UE Service ID is allowed to send a message to the MSGin5G UE.
3. The MSGin5G Server forwards the MSGin5G message request to the target MSGin5G Client as specified in clause 8.3.3.
4. If the message delivery status report is requested by the Non-3GPP UE, the MSGin5G Client in MSGin5G UE sends an MSGin5G message delivery status report to the MSGin5G Server specified in clause 8.3.4, the MSGin5G Server sends the MSGin5G message delivery status report to the Non-3GPP Message Gateway specified in clause 8.3.5, the Non-3GPP Message Gateway translates the MSGin5G message delivery status report to a Non-3GPP message delivery status report and sends it to the Non-3GPP UE.

8.7.2 Application-to-Point Message delivery procedures

8.7.2.1 From Application Server to MSGin5G UE

Figure 8.7.2.1-1 shows the message delivery procedure from Application Server to MSGin5G UE.

Pre-conditions:

1. The MSGin5G Client is registered with the MSGin5G Server.
2. The Application Server has established secured communication with the MSGin5G Server.

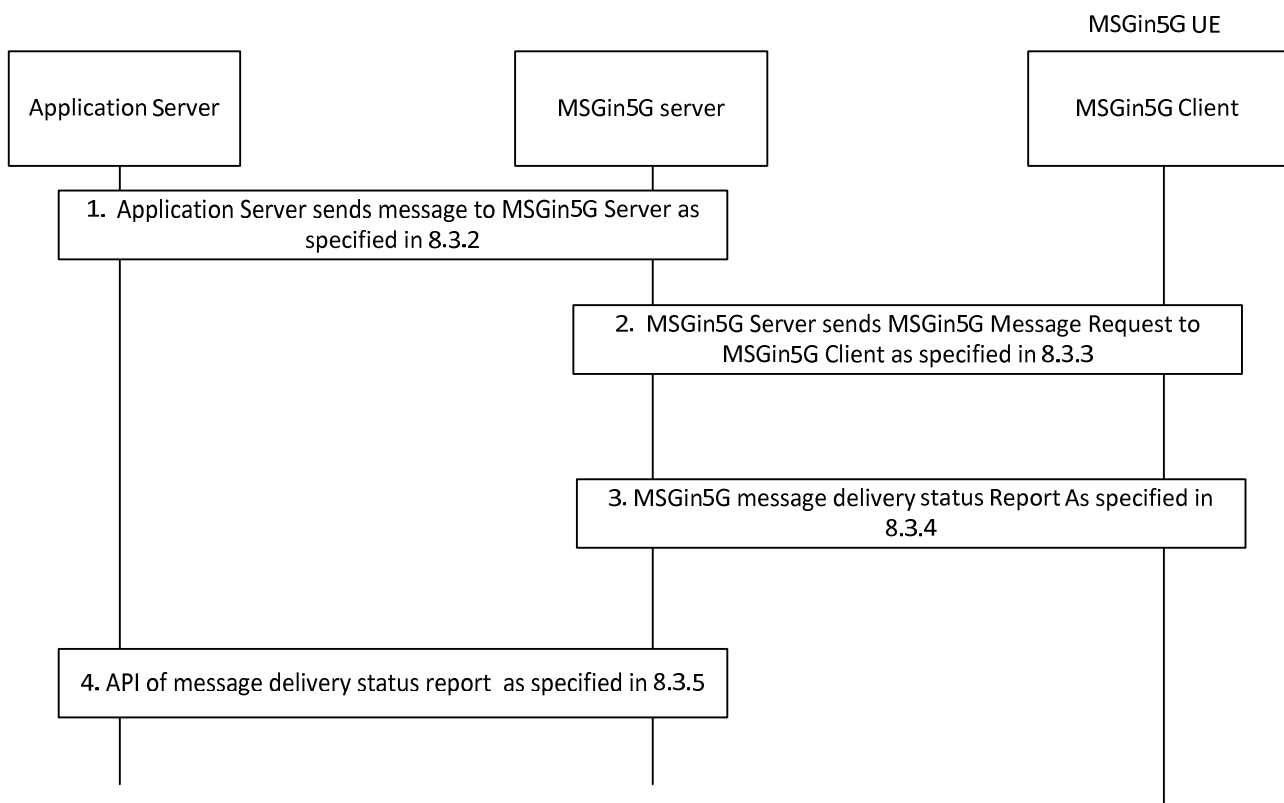


Figure 8.7.2.1-1: Message delivery from Application Server to MSGin5G UE

1. The Application Server sends an API Request to MSGin5G Server for sending MSGin5G message as specified in clause 8.3.2 with the following clarifications:
 - a) The API request includes Originating AS Service ID, Recipient UE Service ID, and Message ID information elements from Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
 - b) Upon receiving the API Request for MSGin5G message delivery, the MSGin5G Server determines if the Application Server is allowed to send a message to the MSGin5G UE.
2. The MSGin5G Server sends the MSGin5G message request to MSGin5G Client as specified in clause 8.3.3.
3. If Delivery status required is included in the MSGin5G message request, MSGin5G Client 2 sends the message delivery status report to the MSGin5G Server specified in clause 8.3.4.
4. The MSGin5G Server sends the message delivery status report to the Application Server as specified in clause 8.3.5.

8.7.2.2 From Application Server to Legacy 3GPP UE

Figure 8.7.2.2-1 shows the message delivery procedure from Application Server to Legacy 3GPP UE.

Pre-conditions:

1. The Application Server has established secured communication with the MSGin5G Server.
2. The Legacy 3GPP Message Gateway has registered with the MSGin5G Server on behalf of the client in the Legacy 3GPP UE.
3. Legacy 3GPP Message Gateway is aware of the legacy 3GPP message client (i.e. SMS client) in Legacy 3GPP UE and provides the mapping to UE Service ID.

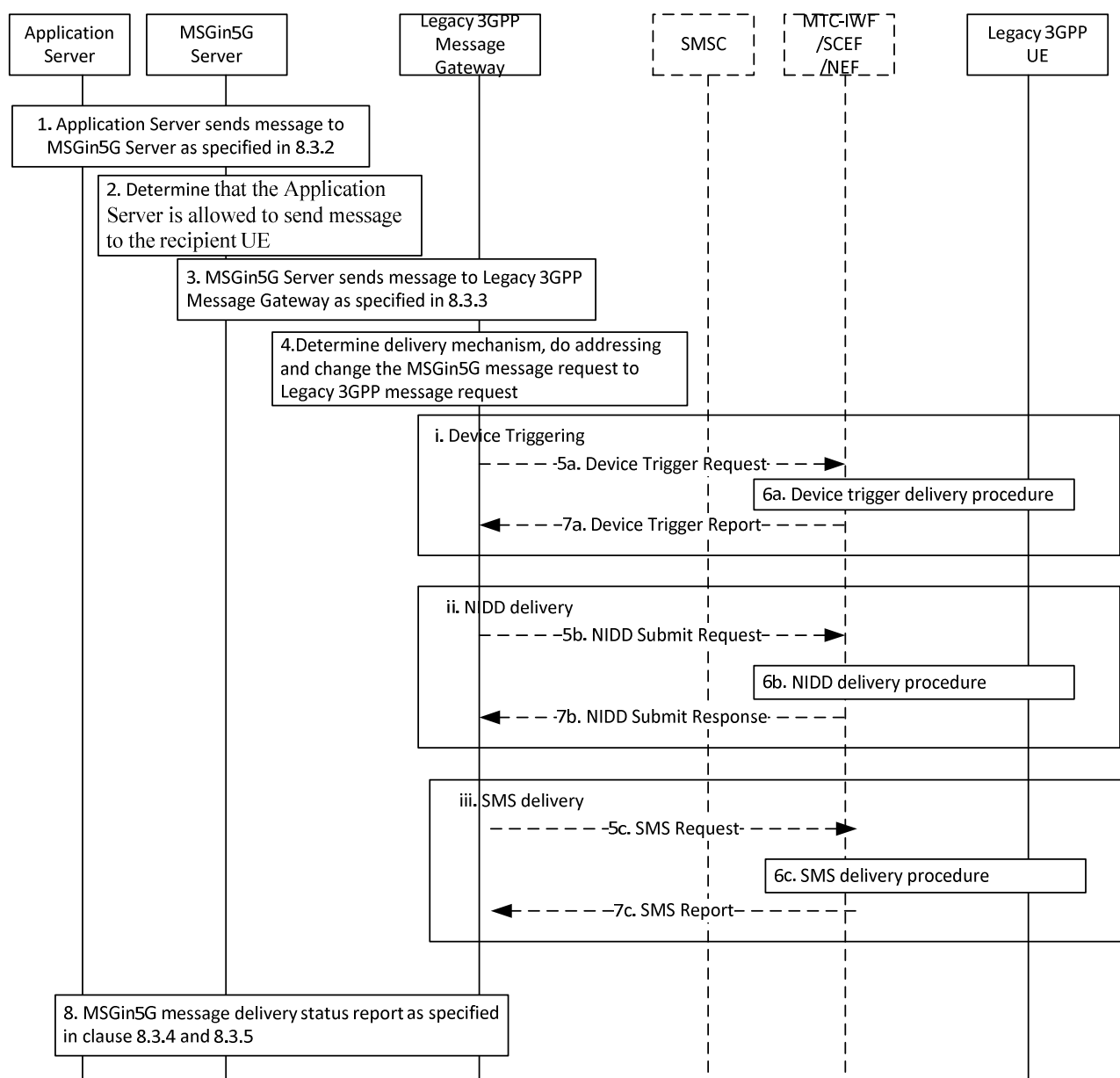


Figure 8.7.2.2-1: Application Server to Legacy 3GPP UE messaging

1. The Application Server sends an API Request to the MSGin5G Server for sending an MSGin5G message as specified in clause 8.3.2 with the following clarifications:

- a) The API Request includes Originating AS Service ID, Recipient UE Service ID, and Message ID information elements from Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
2. Upon receiving the API Request for MSGin5G message delivery, the MSGin5G Server determines if the Application Server is allowed to send a message to the recipient UE.
3. The MSGin5G Server sends the MSGin5G message request to the recipient based on the UE Service ID. The Legacy 3GPP Gateway receives the MSGin5G message request on behalf of the Legacy 3GPP UE as specified in clause 8.3.3.
- 4-7. Same with step 4-7 in clause 8.7.1.2.
8. The Legacy 3GPP Message Gateway sends the MSGin5G message delivery status report to the MSGin5G Server as specified in clause 8.3.4.

8.7.2.3 From Application Server to Non-3GPP UE

Figure 8.7.2.3-1 shows the message delivery procedure from Application Server to Non-3GPP UE.

Pre-conditions:

1. The Application Server has established a secured communication with the MSGin5G Server.
2. The Non-3GPP Message Gateway has registered with the MSGin5G Server on behalf of the message client in the Non-3GPP UE.
3. Non-3GPP Message Gateway is aware of the non-3GPP message client in Non-3GPP UE and provides the mapping to UE Service ID.

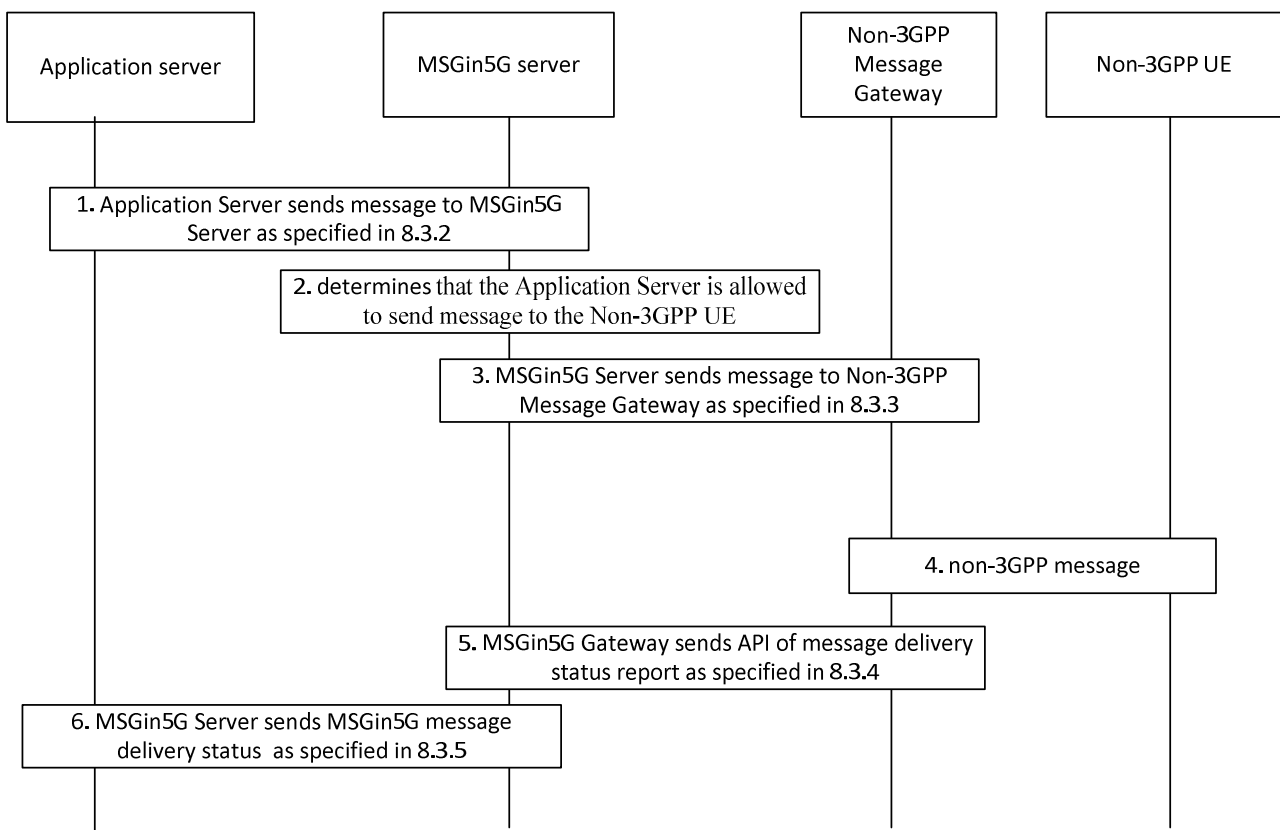


Figure 8.7.2.3-1 Application Server to Non-3GPP UE messaging

1. The Application Server sends an API Request to the MSGin5G Server for sending an MSGin5G message as specified in 8.3.2 with the following clarifications:
 - a) The API Request includes Originating AS Service ID, Recipient UE Service ID, and Message ID information elements from Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
2. Upon receiving the API Request for MSGin5G message delivery, the MSGin5G Server determines if the Application Server is allowed to send a message to the Non-3GPP UE.
3. The MSGin5G Server sends the MSGin5G message request to the recipient based on the UE Service ID. The Non-3GPP Message Gateway receives the MSGin5G message request on behalf of the Non-3GPP UE as specified in clause 8.3.3.
4. The Non-3GPP Message Gateway translates the MSGin5G message to the Non-3GPP message and sends it to the Non-3GPP UE. This step is outside the scope of the present specification.
- 5-6. If message delivery status report is required, the Non-3GPP Message Gateway sends the MSGin5G message delivery status report to the MSGin5G Server as specified in clause 8.3.4, the MSGin5G Server sends the message delivery status report to the Application Server as specified in clause 8.3.5.

8.7.3 Point-to-Application Message delivery procedures

8.7.3.1 From MSGin5G UE to Application Server

Figure 8.7.3.1-1 shows the message delivery procedure from MSGin5G UE to Application Server.

Pre-conditions:

1. The Application Server and MSGin5G Client in MSGin5G UE have registered with the MSGin5G Server.

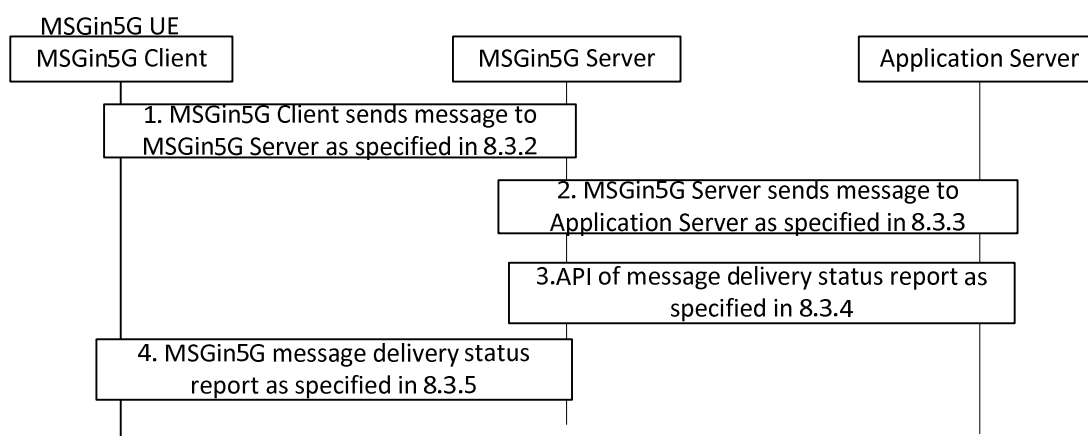


Figure 8.7.3.1-1: Message delivery from MSGin5G UE to Application Server

1. The MSGin5G Client sends an MSGin5G message request to the MSGin5G Server as specified in clause 8.3.2 with the following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient AS Service ID, and Message ID information elements from Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
 - b) Upon receiving the MSGin5G message request, the MSGin5G Server determines if the MSGin5G Client is allowed to send message to Application Server.
2. The MSGin5G Server forwards the MSGin5G message request to the Application Server as specified in clause 8.3.3.

- 3-4. If Delivery status required is included in the MSGin5G message request, the Application Server sends the message delivery status report to the MSGin5G Server as specified in clause 8.3.4, the MSGin5G Server sends the delivery status to MSGin5G Client as specified in clause 8.3.5.

8.7.3.2 From Legacy 3GPP UE to Application Server

This procedure is used for message reply from Non-3GPP UE to Application Server.

Figure 8.7.3.2-1 shows the message delivery procedure from Legacy 3GPP UE to Application Server.

Pre-conditions:

1. The Application Server has established secured communication with the MSGin5G Server.
2. The Legacy 3GPP Message Gateway has registered with the MSGin5G Server on behalf of the message client in the Legacy 3GPP UE.
3. The Legacy 3GPP UE received a message from the Application Server.
4. The Legacy 3GPP Message Gateway is aware of the Legacy 3GPP Message client on the Legacy 3GPP UE and provides the mapping between its identifiers and UE Service ID.
5. The Legacy 3GPP Message Gateway implementation supports storing a messaging transaction, i.e. mapping the message originating MSGin5G Service ID and the message delivered to the Legacy 3GPP UE, for an operator configured time period to allow if the Legacy 3GPP UE will send a response to the incoming message.

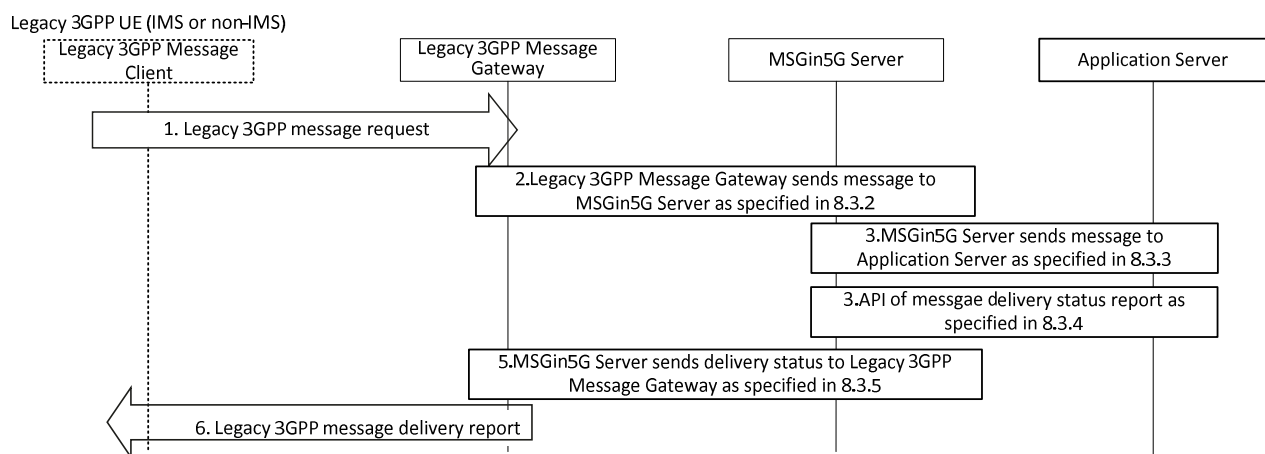


Figure 8.7.3.2-1: Legacy 3GPP UE replies to Application Server

1. The Legacy 3GPP UE sends a Legacy 3GPP message request to the Legacy 3GPP Message Gateway (e.g. through SMSC if SMS is used according the procedure in 3GPP TS 23.204 [13] or the procedure in clause 4.13.3 of TS 23.502 [7]).
2. The Legacy 3GPP Message Gateway translates the Legacy 3GPP message into an MSGin5G message and may include message delivery status report requested in the MSGin5G message. The Legacy 3GPP Message Gateway sends the MSGin5G message request to the MSGin5G Server as specified in clause 8.3.2 with the following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient AS Service ID and Message ID information elements from Table 8.3.2-1, and may include Delivery status required, and may include Application ID, Payload and Priority type information elements from Table 8.3.2-1.
 - b) Upon receiving the MSGin5G message request, the MSGin5G Server determines if the Legacy 3GPP UE with its UE Service ID is allowed to send a message to the Application Server.
3. The MSGin5G Server forwards the MSGin5G message in API request to the Application Server as specified in clause 8.3.3.

- 4-6. If message delivery status report is requested, the Application Server sends the message delivery status report by API request to the MSGin5G Server as specified in clause 8.3.4, the MSGin5G Server forwards the message delivery status report to the Legacy 3GPP Message Gateway as specified in clause 8.3.5, the Legacy 3GPP Message Gateway translates the MSGin5G message delivery status report into a Legacy 3GPP message delivery status report and sends it to the Legacy 3GPP UE.

8.7.3.3 From Non-3GPP UE to Application Server

This procedure is used for message reply from Legacy 3GPP UE to Application Server.

Figure 8.7.3.3-1 shows the message delivery procedure from Non-3GPP UE to Application Server.

Pre-conditions:

1. The Application Server has established secured communication with the MSGin5G Server.
2. The Non-3GPP Message Client in Non-3GPP UE has registered with the MSGin5G Server via the Non-3GPP Message Gateway.
3. The Non-3GPP UE received a message from the Application Server.
4. The Non-3GPP Message Gateway is aware of the Non-3GPP message client on the Non-3GPP UE and provides the mapping between its identifiers and UE Service ID.
5. The Non-3GPP Message Gateway implementation supports storing a messaging transaction, i.e. mapping the message originating MSGin5G Service ID and the message delivered to the Non-3GPP UE, for an operator configured time period to allow if the Non-3GPP UE will send a response to the incoming message.

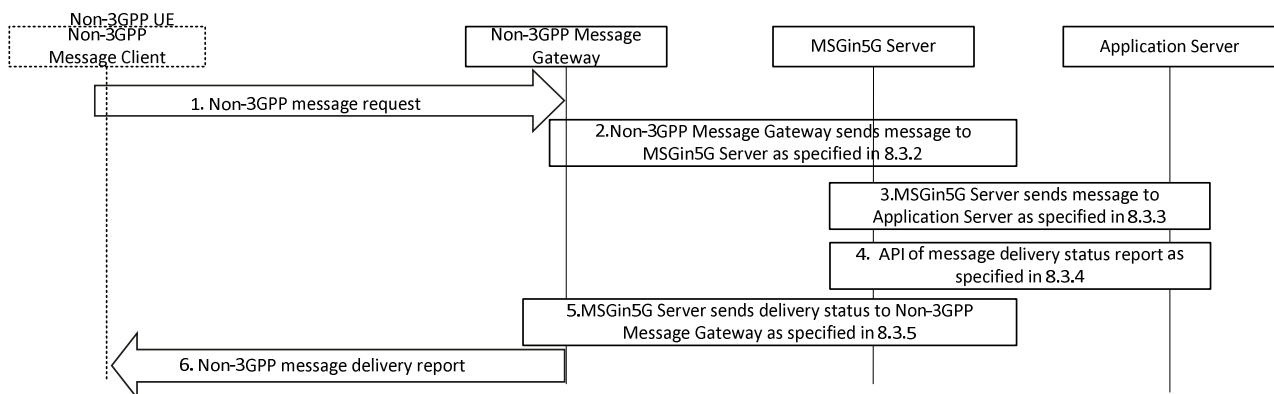


Figure 8.7.3.3-1: Non-3GPP UE replies to Application Server

1. The Non-3GPP UE sends a Non-3GPP message request to the Non-3GPP Message Gateway.
2. The Non-3GPP Message Gateway translates the Non-3GPP Message into an MSGin5G message and may include MSGin5G message delivery status report requested in the MSGin5G message. The Non-3GPP Message Gateway sends an MSGin5G message request to the MSGin5G Server as specified in clause 8.3.2 with the following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient AS Service ID, and Message ID information elements in Table 8.3.2-1, and may include Delivery status required, Application ID, Payload, Priority type information elements from Table 8.3.2-1.
 - b) Upon receiving the MSGin5G message request, the MSGin5G Server determines if the Non-3GPP UE with its UE Service ID is allowed to send a message to the Application Server.
3. The MSGin5G Server forwards the MSGin5G message in an API request to the Application Server as specified in clause 8.3.3.

- 4-6. If the delivery status is required, the Application Server sends a message delivery status report by API request to the MSGin5G Server as specified in clause 8.3.4, the MSGin5G Server sends the message delivery status report to the Non-3GPP Message Gateway as specified in clause 8.3.5, the Non-3GPP Message Gateway translates the MSGin5G message delivery status report into a Non-3GPP message delivery status report and sends it to the Non-3GPP UE.

8.7.4 MSGin5G Group messaging

8.7.4.1 General

This clause introduces a group messaging procedure for MSGin5G Client and MSGin5G Server to send and receive Group messages after a group is created. In this procedure, the group creation and membership management are handled by group management function specified in 3GPP TS 23.434 [5].

8.7.4.2 Message delivery from UE to group

Figure 8.7.4.2-1 shows the MSGin5G Group messaging procedure in which MSGin5G Client (both IMS and non-IMS UE) sends a message to a group.

Pre-conditions:

1. An MSGin5G Group is created by following group management SEAL service procedures as specified in 3GPP TS 23.434 [5].
2. All participants in the MSGin5G Group may get the Group information i.e. the Group Service ID.
3. The MSGin5G Server has a copy of the group profile with all the group members by using Group information query specified in 3GPP TS 23.434 [5].

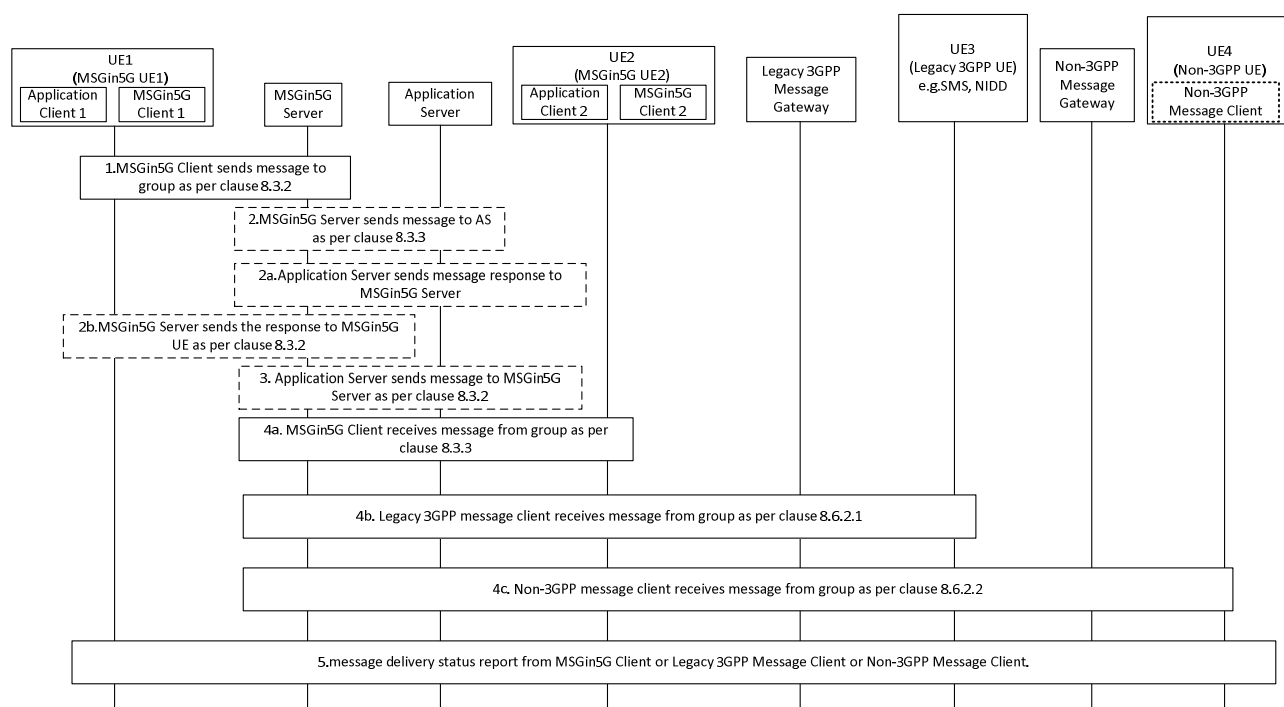


Figure 8.7.4.2-1: Group messaging in MSGin5G Service

1. The MSGin5G Client 1 sends a message to a group as specified in clause 8.3.2 with following clarifications:
 - a) The MSGin5G message request includes Originating UE Service ID, Recipient Group Service ID and Message ID information elements from Table 8.3.2-1. The MSGin5G message request may include Delivery status required, Application ID, Payload and Priority type information elements from Table 8.3.2-1.

2. Upon receiving the MSGin5G message request to send the group message, the MSGin5G Server may send the message to the Application Server based on service ID present in the received MSGin5G message request (e.g. to log application specific message or for analytics). Otherwise go to step 4.
 - a) Upon receiving the MSGin5G message request, the Application Server validates the message and if the message is not valid, the Application Server sends MSGin5G message response with delivery status set as Reject to the MSGin5G Server. Otherwise, go to step 3.
 - b) The MSGin5G Server sends the MSGin5G message response with delivery status set as reject to the MSGin5G Client 1. The information elements defined in Table 8.3.2-3 are included in the response. Following procedures will be skipped.
3. The Application Server initiates to send message to all group members and sends the MSGin5G message request to the MSGin5G Server.
4. Upon receiving the MSGin5G message request, if the MSGin5G Server determines the MSGin5G Client-1 is authorized to send the group message, the MSGin5G Server resolves the group ID to determine the members of that group, based on the information from the group management server as specified in 3GPP TS 23.434 [5].

NOTE: If the originating UE is member of the group, the originating UE is not included as recipient of the group message.

5. The MSGin5G Server sends the message to all participants of the group by their UE Service ID. The MSGin5G message request includes Originating UE Service ID, Recipient Group ID, Recipient UE Service ID, Message ID, Payload information elements from Table 8.3.3-1. The MSGin5G message request may include Delivery status required, Application ID and Priority type information elements from Table 8.3.3-1. The MSGin5G Server routes, using the procedures in clause 8.3.3, the message to:
 - a) a MSGin5G UE,
 - b) a Legacy 3GPP UE,
 - c) a Non-3GPP UE.

NOTE: Steps 5 a), 5 b) and 5 c) can happen in parallel and in any order.

5. Upon receiving the group message, if message delivery status report is requested and if supported by target message client, the MSGin5G Client or Legacy 3GPP UE or Non-3GPP message client sends the message delivery status report to originator MSGin5G Client 1 as specified in clause 8.2.4 and 8.3.5.

8.7.4.3 Message delivery procedure from Application Server to group

Figure 8.6.4.3-1 shows the MSGin5G Group messaging procedure in which the Application Server sends a message to a group.

Pre-conditions:

1. An MSGin5G Group is created by following group management SEAL service procedures as specified in 3GPP TS 23.434 [5].

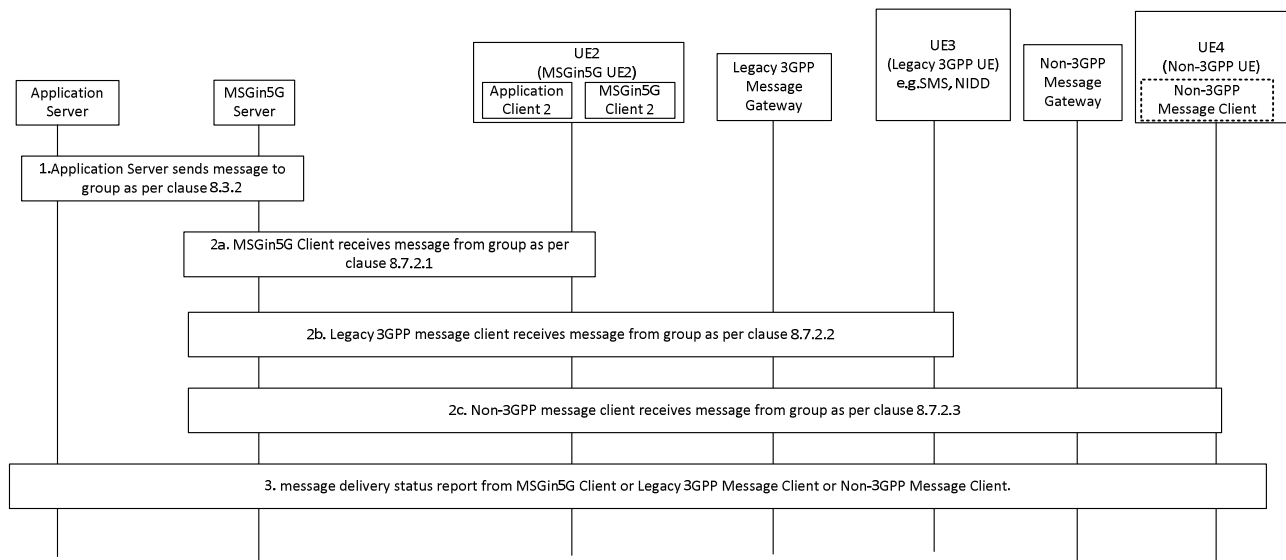


Figure 8.7.4.3-1: Group messaging in MSGin5G Service

1. The Application Server sends a message to a group as specified in clause 8.3.2.
 2. Upon receiving the MSGin5G message request, if the AS is authorized to send the group message, the MSGin5G Server resolves the group ID to determine the members of that group, based on the information from the group management server specified in 3GPP TS 23.434 [5].
 3. The MSGin5G Server sends the message to all participants of the group based on UE Service ID. The MSGin5G message Request includes Originating AS Service ID, Recipient Group ID, Recipient UE Service ID, Message ID, Payload information elements from Table 8.3.3-1. The MSGin5G message Request may include Delivery Status Required, Application ID and Priority Type information elements from Table 8.3.3-1. The MSGin5G Server routes, using the procedures in clause 8.7.2, the message to:
 - a) a MSGin5G UE,
 - b) a Legacy 3GPP UE,
 - c) a Non-3GPP UE.
- NOTE: Steps 3 a), 3 b) and 3 c) can happen in parallel and in any order.
4. Upon receiving the group message, if message delivery status report is requested and if supported by the target message client, the MSGin5G Client or Legacy 3GPP UE or Non-3GPP message client sends the message delivery status report to originator Application Server as specified in clause 8.3.4 and 8.3.5.

8.7.5 Message delivery between different PLMNs

8.7.5.1 General

MSGin5G messages may be delivered between different PLMNs.

The procedure specified in clause 8.7.5.2 applies to Point-to-Point message, Group message, and may also apply to AS-to-Point message and Point-to-AS message delivery if agreed by the business agreement between the PLMN operators. The procedure specified in clause 8.7.5.3 applies to Message delivery based on Messaging Topic.

8.7.5.2 Inter-PLMN message exchange procedure

Pre-condition:

1. The Message Sender (e.g. MSGin5G Client 1 in MSGin5G UE 1) is registered to the MSGin5G Server 1 in one PLMN.
2. The Message Receiver (e.g. MSGin5G Client 2 in MSGin5G UE 2) is registered to the MSGin5G Server 2 in another PLMN.
3. MSGin5G Server 1 and MSGin5G Server 2 have established a secured connection based on NDS/IP specified in 3GPP TS 33.210 [20].

Figure 8.7.5.2-1 shows message delivery between MSGin5G endpoints in different PLMNs, where the Message Sender is registered in MSGin5G Server 1 and the Message Receiver is registered in MSGin5G Server 2.

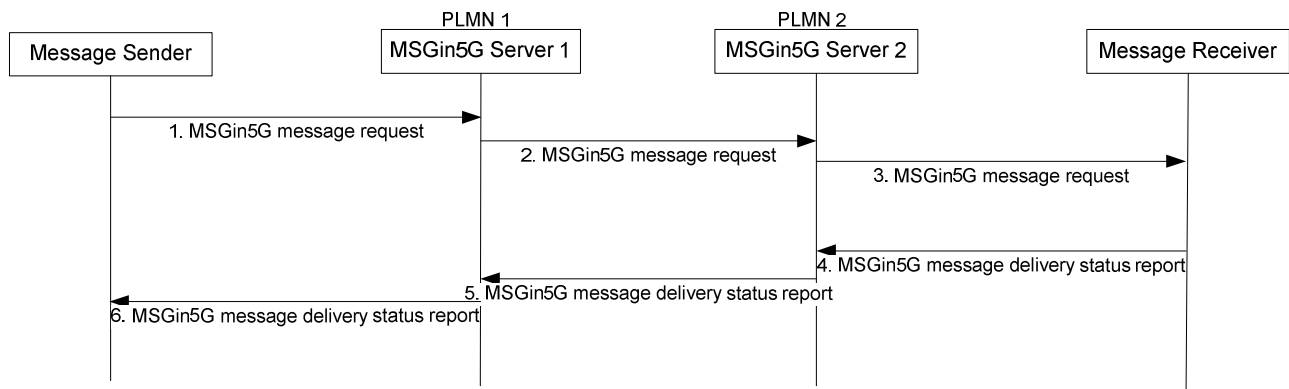


Figure 8.7.5.2-1: Message delivery between MSGin5G UEs in different PLMNs

1. The Message Sender sends an MSGin5G message request to MSGin5G Server 1 in PLMN 1 as specified in clause 8.3.2.
2. The MSGin5G Server 1 analyses the target UE Service ID and determines that the message is targeted to the Message Receiver in PLMN 2, authenticates that the Message Sender is allowed to send a message to the Message Receiver, and then the MSGin5G Server 1 forwards the MSGin5G message request to MSGin5G Server 2 in PLMN 2. The MSGin5G message request contains the Information Elements as specified in table 8.3.3-1.
3. MSGin5G Server 2 forwards the MSGin5G message request to the Message Receiver as specified in clause 8.3.3.
- 4-6. If the message delivery status report is requested, the Message Receiver sends a message delivery status report to Message Sender as per procedure specified in clause 8.3.4 and 8.3.5.

8.7.5.3 Inter-PLMN message exchange procedure based on Messaging Topic

Figure 8.7.5.3-1 shows the inter-PLMN Message delivery based on Messaging Topic when MSGin5G Server 2 forwards the Messaging Topic subscription request from the MSGin5G UE/Application Server served by it to MSGin5G Server 1 as specified in clause 8.8.4.

Pre-condition:

1. The Message Sender (e.g. an MSGin5G UE, a Message Gateway on behalf of a Non-MSGin5G UE or an Application Server) is registered to the MSGin5G Server 1 in PLMN 1.
2. The Message Receiver (e.g. an MSGin5G UE, a Message Gateway on behalf of a Non-MSGin5G UE or an Application Server) is registered to the MSGin5G Server 2 in PLMN 2.
3. MSGin5G Server 1 and MSGin5G Server 2 have established a secured connection.
4. MSGin5G Client or Application Server served by MSGin5G Server 2 has subscribed to a Messaging Topic with the MSGin5G Server 1 as specified in clause 8.8.4 via MSGin5G Server 2.

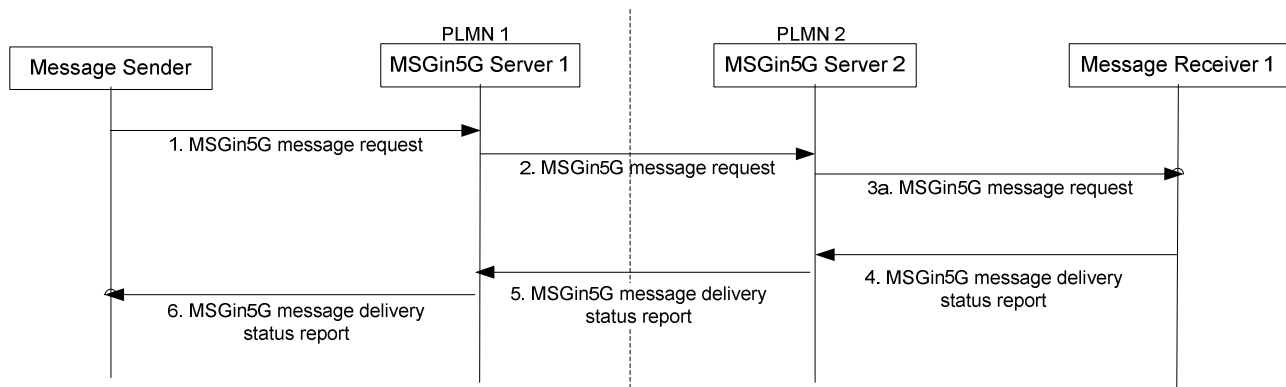


Figure 8.7.5.3-1: Message delivery between MSGin5G UEs in different PLMNs

1. The Message Sender sends an MSGin5G message request (if the sender is an MSGin5G UE) or API request (if the sender is an Application Server or a Message Gateway on behalf of a Non-MSGin5G UE) to MSGin5G Server 1 in PLMN 1 as specified in clause 8.3.2. A Messaging Topic is included in this request.
2. The MSGin5G Server 1 checks the subscriptions of the Messaging Topic included in the request and obtains the UE Service ID/AS Service ID of the Message Receivers. The MSGin5G Server 1 determines that the message with this Messaging Topic is needed to be delivered to an MSGin5G UE/Application Server served by Message Server 2 in PLMN 2 based on the UE Service ID/AS Service ID of the Message Receiver. The MSGin5G Server 1 then sends the MSGin5G message to MSGin5G Server 2. The MSGin5G message request contains the Information Elements as specified in table 8.3.3-1.
- 3 The MSGin5G Server 2 delivers the MSGin5G message request to Messenger Receiver based on the UE Service ID/AS Service ID in the message as specified in clause 8.3.3.
- 4-6. If the message delivery status report is requested, the Message Receiver sends message delivery status report to Message Sender as per procedure specified in clause 8.3.4 and 8.3.5.

Figure 8.7.5.3-2 shows the inter-PLMN Message delivery to subscribing service endpoints based on Messaging Topic when MSGin5G Server 2 subscribes the Messaging Topic on behalf of all MSGin5G UEs/Application Servers served by it as specified in clause 8.8.4.

Pre-condition:

1. The Message Sender (e.g. an MSGin5G UE, a Message Gateway on behalf of a Non-MSGin5G UE or an Application Server) is registered to the MSGin5G Server 1 in PLMN 1.
2. The Message Receiver (e.g. an MSGin5G UE, a Message Gateway on behalf of a Non-MSGin5G UE or an Application Server) is registered to the MSGin5G Server 2 in PLMN 2.
3. MSGin5G Server 1 and MSGin5G Server 2 have established a secured connection.
4. MSGin5G Server 2 subscribed to a Messaging Topic with the MSGin5G Server 1 as specified in clause 8.8.4. A Messaging Topic with the MSGin5G Server 2 address of the subscriber has been created on MSGin5G Server 1.
5. The MSGin5G Client or Application Server served by MSGin5G Server 2 subscribed to the Messaging Topic with the MSGin5G Server 2. A Messaging Topic with the UE Service ID/AS Service ID of the subscriber has been created on MSGin5G Server 2.

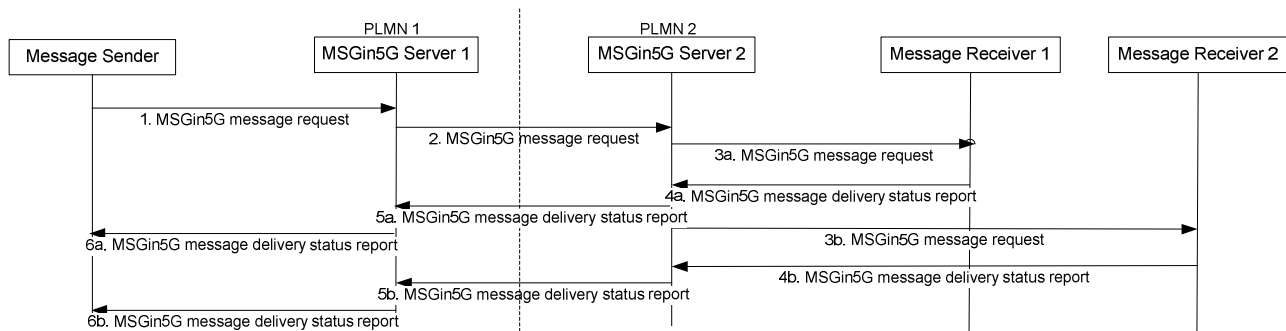


Figure 8.7.5.3-2: Message delivery between MSGin5G UEs in different PLMNs

1. The Message Sender sends an MSGin5G message request (if the sender is an MSGin5G UE) or API request (if the sender is an Application Server or a Message Gateway) to MSGin5G Server 1 in PLMN 1 as specified in clause 8.3.2. A Messaging Topic is included in this request.
2. The MSGin5G Server 1 checks the subscription of the Messaging Topic included in the request. The MSGin5G Server 1 determines that the message with this Messaging Topic is needed to be delivered to the Message Server 2 in PLMN 2 and sends the MSGin5G message to MSGin5G Server 2. The MSGin5G message request contains the Information Elements as specified in table 8.3.2-1.
- 3a The MSGin5G Server 2 checks the subscription of the Messaging Topic included in the inbound request. The MSGin5G Server 2 delivers the MSGin5G message request to Message Receiver 1 based on its UE Service ID/AS Service ID as specified in clause 8.8.2.
- 3b The MSGin5G Server 2 also delivers the MSGin5G message request to Message Receiver 2 which subscribed to this Messaging Topic as specified in clause 8.8.2.
- 4a-6a. If the message delivery status report is requested, the Message Receiver 1 sends message delivery status report to Message Sender as per procedure specified in clause 8.3.4 and 8.3.5.
- 4b-6b. If the message delivery status report is requested, the Message Receiver 2 sends message delivery status report to Message Sender as per procedure specified in clause 8.3.4 and 8.3.5.

8.7.6 Broadcast message delivery

8.7.6.1 General

This clause introduces a Broadcast message procedure for an Application Server and an MSGin5G UE to send a Broadcast message. In this procedure, an MSGin5G message is delivered via broadcast to MSGin5G UEs or non-MSGin5G UEs in a Broadcast Area.

8.7.6.2 Broadcast message delivery procedure

Figure 8.7.6.2-1 shows the Broadcast message delivery procedure from Application Server or MSGin5G UE to the UEs in Broadcast Area.

Pre-condition:

1. Application Server or MSGin5G Client in MSGin5G UE has registered with the MSGin5G Server.

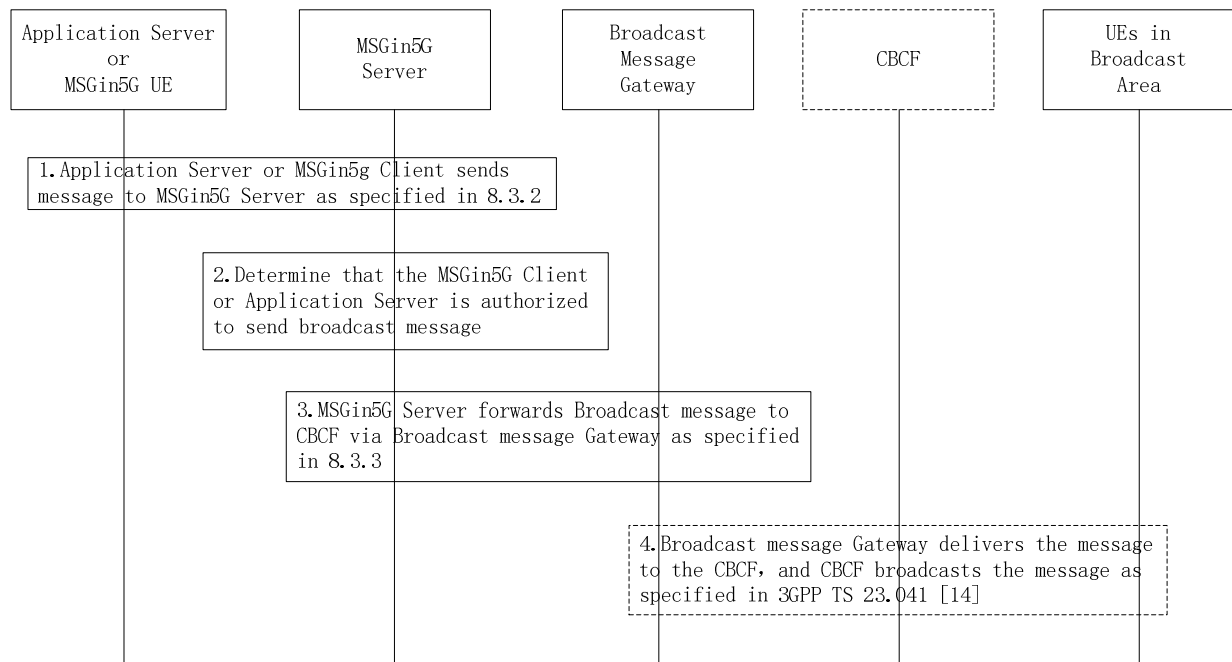


Figure 8.7.6.2-1: Message Delivery in Broadcast Area

1. An MSGin5G message request is sent by an Application Server or an MSGin5G UE to the MSGin5G Server as specified in clause 8.3.2 with following clarifications:
 - a) The MSGin5G message includes Originating UE Service ID/AS service ID, Broadcast Area ID and Message ID information elements in Table 8.3.2-1, and may include Delivery status required, Application ID, Payload information elements from Table 8.3.2-1.
2. The MSGin5G Server determines if the Application Server or MSGin5G Client is authorized to send a Broadcast message.
3. The MSGin5G Server forwards the Broadcast message request to the CBCF (as specified in 3GPP TS 23.041 [14]) via the Broadcast Message Gateway based on the Broadcast Area ID as specified in 8.3.3.
4. The Broadcast Message Gateway delivers the message to the CBCF which broadcasts the message to the MSGin5G UEs in the Broadcast Area or to the non-MSGin5G UEs in the Broadcast Area. This step is out of scope of the present specification.

If the Delivery status requested information element is included in the MSGin5G Broadcast message, a recipient MSGin5G UE sends the delivery report as specified in clause 8.3.4.

8.8 Other MSGin5G messaging related procedures

8.8.0 General

In order to receive the message with a specific Messaging Topic, a UE or an Application Server subscribes to this Messaging Topic. The procedures of a MSGin5G Server creating a Messaging Topic and a UE or an Application Server subscribing/unsubscribing one or more Messaging Topic(s) from an MSGin5G Server are specified in clause 8.8.1 and clause 8.8.3.

When a Messaging Topic(s) has already been created on a different MSGin5G server, an MSGin5G Server needs to learn the available Messaging Topics on the other MSGin5G Server. An MSGin5G Server may use the Messaging Topic list subscription procedure specified in clause 8.8.4.2 to learn the Messaging Topics available on the other MSGin5G Server. The corresponding Messaging Topic list unsubscription procedure is specified in clause 8.8.4.2a.

An MSGin5G Server may subscribe one or more Messaging Topic(s) on the other MSGin5G Server on behalf of the UE(s) and/or Application Sever(s) if the Messaging Topic list are not hosted locally. The procedure of MSGin5G Server subscribing one or more Messaging Topic(s) from the other MSGin5G Server is specified in clause 8.8.4.3 and the corresponding unsubscription procedure is specified in clause 8.8.4.4.

A MSGin5G Server may also forward a subscription request to the MSGin5G Server that already handles the Messaging Topic.

8.8.1 Messaging Topic Subscription

An MSGin5G Client or an Application Server can subscribe one or more Messaging Topic(s) on the MSGin5G Server. The Messaging Topic IE will be populated by the Application Client or the Application Server and the content of this IE is out of scope.

When an MSGin5G Client or an Application Server is subscribed to a Messaging Topic, then the MSGin5G Server will deliver messages that contain the same Messaging Topic to the subscribers.

Figure 8.8.1-1 shows the MSGin5G Client/Application Server subscribing to Messaging Topic(s) on the MSGin5G Server.

Pre-conditions:

1. The MSGin5G Client or Application Server has registered to the MSGin5G Server.

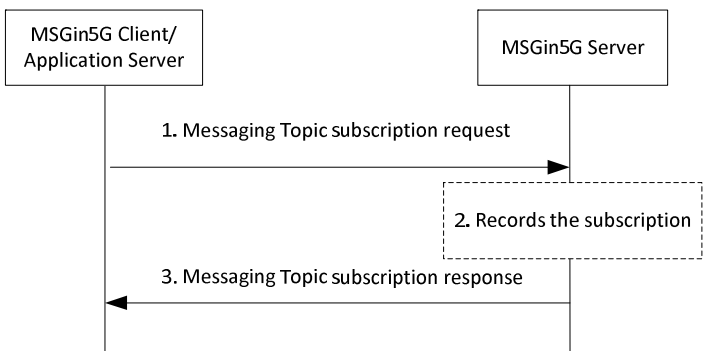


Figure 8.8.1-1: MSGin5G Service endpoint subscribes to Messaging topic(s)

1. The MSGin5G Client or Application Server sends a Messaging Topic subscription request to the MSGin5G Server. The request includes the information elements listed in Table 8.8.1-1.

Table 8.8.1-1: Messaging Topic subscription request

Information element	Status	Description
Originating UE Service ID/AS Service ID	M	The service identity of the sending MSGin5G Client or the sending Application Server.
Messaging Topic	M	A list of Messaging Topic(s) that is to be subscribed. The number of Messaging Topic(s) included in this IE can be one or more.
Expiration	O	The date and time when the subscription expires. This date and time apply to all Messaging Topic(s) subscribed in this request. If this IE is included, the value of it should be larger than 0. If this IE is not included, the expiration time is subject to operator policy.
NOTE: The content of the Messaging Topic is out of scope of the present document.		

2. The MSGin5G Server validates the Messaging Topic subscription request and checks the locally stored Messaging Topic(s).

- a) If the subscribed Messaging Topic has already been created, the MSGin5G Server checks whether the UE Service ID/AS Service ID of the subscriber is already included in the subscribers list of this Messaging Topic.
 1. If not, the MSGin5G Server adds the UE Service ID/AS Service ID of the subscriber to the subscribers list of this Messaging Topic. The MSGin5G Server sets the validity time of this subscription to the value of the Expire IE or to a default value according to the service policy.
 2. Else, the MSGin5G Server updates the validity time of this subscription.
 - b) If the subscribed Messaging Topic has not been already created, the MSGin5G Server creates this Messaging Topic, and adds the UE Service ID/AS Service ID of the subscriber to the subscribers list of this Messaging Topic. The MSGin5G Server sets the validity time of this subscription to the value of the Expire IE or to a default value according to the service policy.
3. The MSGin5G Server sends a Messaging Topic Subscription response to the originator of the request. The response includes the information listed in Table 8.8.1-2.

Table 8.8.1-2: Messaging Topic Subscription response

Information element	Status	Description
Subscription status	M	Indicates whether the subscription was successfully added or deleted on the MSGin5G Server.
Expiration	O	The validity date and time of this subscription set by the MSGin5G Server.

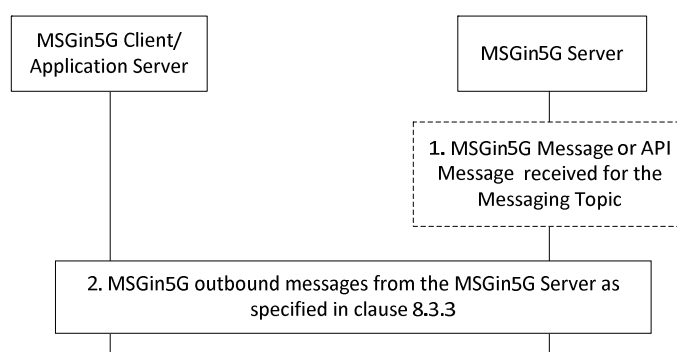
8.8.2 Message delivery based on Messaging Topic

If an MSGin5G Client or an Application Server is in the subscribers list of a Messaging Topic, the MSGin5G Server delivers messages that contain this Messaging Topic to it.

Figure 8.8.2-1 shows the Message delivery to a subscribing service endpoint based on Messaging Topic.

Pre-conditions:

1. The MSGin5G Client or Application Server subscribed to a Messaging Topic with the MSGin5G Server. A Messaging Topic with the UE Service ID/AS Service ID of the subscriber has been created.

**Figure 8.8.2-1: Message delivery to subscribing service endpoint based on Messaging Topic**

1. The MSGin5G Server receives an MSGin5G message request or an API message request corresponding to step 2 in figures 8.3.2-1 or 8.3.2-2 which includes the IEs as listed in table 8.3.2-1. The MSGin5G message request or API message request contains a Messaging Topic IE corresponding to the Messaging Topic for which subscription(s) exist.
2. The MSGin5G Server uses the procedure described in clause 8.3.3 to deliver the message to all subscriber(s) of this Messaging Topic. In each message, the UE Service ID/AS Service ID of subscriber should be added as the Recipient UE Service ID/AS Service ID IE specified in table 8.3.3-1.

8.8.3 Messaging Topic Unsubscription

Corresponding to message topic subscription, an MSGin5G Client or an Application Server can unsubscribe from one or more Messaging Topic(s) on the MSGin5G Server.

Figure 8.8.3-1 shows the MSGin5G Client/Application Server unsubscribing to Messaging Topic(s) on the MSGin5G Server.

Pre-condition

1. The MSGin5G Client or Application Server has subscribed one or more message topic(s) on the MSGin5G Server.

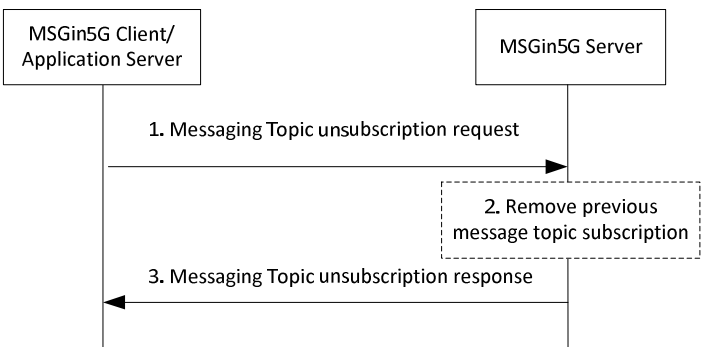


Figure 8.8.3-1: MSGin5G Service endpoint unsubscribes to Messaging topic(s)

1. The MSGin5G Client or Application Server sends a Messaging Topic unsubscription request to the MSGin5G Server. The request includes the information listed in Table 8.8.3-1.

Table 8.8.3-1: Messaging Topic unsubscription request

Information element	Status	Description
Originating UE Service ID/AS Service ID	M	The service identity of the sending MSGin5G Client or the sending Application Server.
Messaging Topic(s)	M	A list of Messaging Topic(s) that is to be unsubscribed. The number of Messaging Topic(s) included in this IE can be one or more.

2. The MSGin5G Server validates the Messaging Topic unsubscription request and checks the locally stored Messaging Topic(s). If the UE Service ID/AS Service ID is included in the subscribers list of this Messaging Topic, the MSGin5G Server removes the UE Service ID/AS Service ID from the subscribers list of this Messaging Topic.
3. The MSGin5G Server sends a Messaging Topic Unsubscription response to the originator of the request. The response includes the information listed in Table 8.8.3-2.

Table 8.8.3-2: Messaging Topic Unsubscription response

Information element	Status	Description
subscription status	M	Indicates whether the subscription was successfully deleted on the MSGin5G Server

NOTE: If the MSGin5G Server holds no more subscriptions for a Messaging Topic then how to handle the locally stored Messaging Topic is implementation specific.

8.8.4 Messaging Topic Subscription handling between different MSGin5G Servers

8.8.4.1 General

When a Messaging Topic(s) is handled between different MSGin5G Servers, the MSGin5G Server 1 may work in the following models, when the subscription for the Messaging Topic exists on Server 2:

- a. Mod.A: the MSGin5G UE/Application Server served by MSGin5G Server 1 subscribes to Messaging Topic(s) and the MSGin5G Server 1 forwards Messaging Topic subscription request from the MSGin5G UE/Application Server to MSGin5G Server 2 or
- b. Mod.B: the MSGin5G UE/Application Server served by MSGin5G Server 1 subscribes to Messaging Topic(s) and the MSGin5G Server 1 subscribes to the Messaging Topic(s) on Server 2 on behalf of all MSGin5G UE/Application Server served by it.

If the subscription for the Messaging Topic already exists on Server 1, or if the subscription does not exist either on Server 1 or on Server 2, the procedure in clause 8.8.1 applies.

The MSGin5G Server may work in one model based on the service policy. The MSGin5G Server 1 and MSGin5G Server 2 can be located in the same PLMN or different PLMNs.

To enable the message delivery based on Messaging Topic between different MSGin5G Servers, an MSGin5G Server shall subscribe the Messaging Topic list from other MSGin5G Servers as specified in clause 8.8.4.2. If the Messaging Topic is created or deleted on an MSGin5G Server, and if there are Messaging Topic list subscriptions from other MSGin5G Server(s), the MSGin5G Server shall send a Messaging Topic list notification to the corresponding MSGin5G Server(s) as specified in clause 8.8.4.2. When an MSGin5G Server receives a Messaging Topic subscription or unsubscription from an MSGin5G Client, it shall handle the Messaging Topic subscription or unsubscription request as specified in clause 8.8.4.3 or clause 8.8.4.4.

8.8.4.2 Messaging Topic list subscription

Before the subscribing of Messaging Topic(s), the MSGin5G Server 1 should obtain the available Messaging Topic list on the MSGin5G Server 2 to determine whether to forward the Messaging Topic subscription request to MSGin5G Server 2, to subscribe to the Messaging Topic on behalf of all MSGin5G UE/Application Server served by it on MSGin5G Server 2, or to create the subscription on Server 1 as specified in clause 8.8.1 if the subscription does not exist on Server 2.

Figure 8.8.4.2-1 shows the MSGin5G Server 1 subscribing to Messaging Topic list on the MSGin5G Server 2.

NOTE 1: If the MSGin5G Server 1 and MSGin5G Server 2 are located in the same PLMN, the synchronization of Messaging Topic list between MSGin5G Servers may also be implementation specific.

Pre-conditions:

1. MSGin5G Server 1 and MSGin5G Server 2 have established a secured connection based on NDS/IP specified in 3GPP TS 33.210 [20].

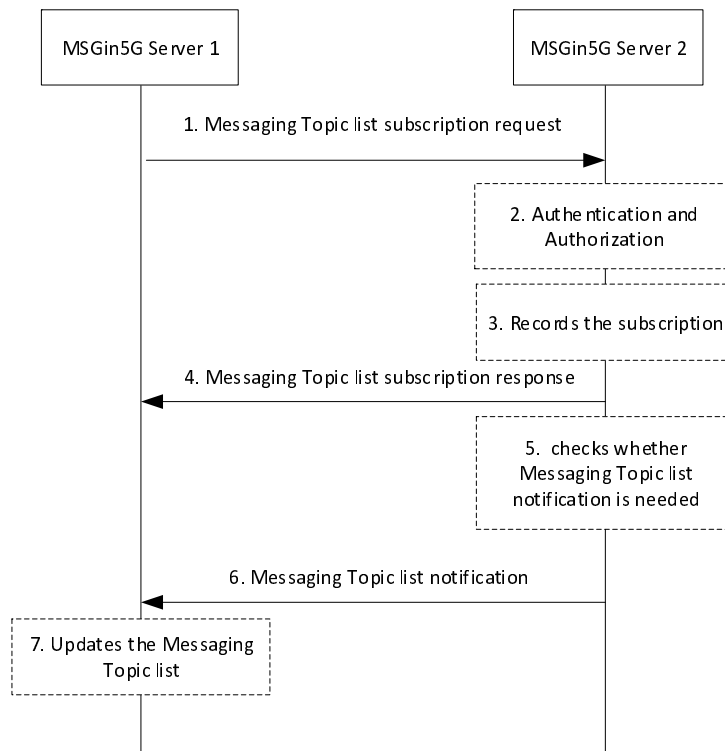


Figure 8.8.4.2-1: MSGin5G Server 1 subscribes to Messaging Topic list on the MSGin5G Server 2

1. The MSGin5G Server 1 sends a Messaging Topic list subscription request to the MSGin5G Server 2. The request includes the information elements listed in Table 8.8.4.2-1.

Table 8.8.4.2-1: Messaging Topic list subscription request

Information element	Status	Description
Originating MSGin5G Server ID	M	The MSGin5G Server which requests the Messaging Topic list.
Recipient MSGin5G Server ID	M	The MSGin5G Server which holds the Messaging Topic list.
Security credentials	O	Security information required by the MSGin5G Server 2 and is left for implementation.
Expiration	O	The date and time when the subscription expires. If this IE is included, the value of it should be larger than 0. If this IE is not included, the expiration time is subject to operator policy.

2. Upon receiving the Messaging Topic list subscription request, the MSGin5G Server 2 validates this request and may verify the security credentials.
3. The MSGin5G Server 2 checks the locally stored Messaging Topic list subscription(s).
 - a) If the MSGin5G Server 1's subscription has already been created, the MSGin5G Server 2 updates the validity time of this subscription.
 - b) If the MSGin5G Server 1's subscription has not been created, the MSGin5G Server 2 creates the subscription.
4. The MSGin5G Server 2 sends a Messaging Topic list Subscription response to MSGin5G Server 1. The response includes the information listed in Table 8.8.4.2-2.

Table 8.8.4.2-2: Messaging Topic list Subscription response

Information element	Status	Description
Subscription status	M	Indicates whether the subscription was successfully added or deleted on the MSGin5G Server 2.
Expiration	O	The validity date and time of this Messaging Topic list subscription set by the MSGin5G Server 2.

5. The MSGin5G Server 2 checks whether Messaging Topic list notification is needed, e.g. whether the MSGin5G Server 1 subscribes the Messaging Topic list on MSGin5G Server 2 for the first time, or the local Messaging Topic(s) on the MSGin5G Server 2 are updated, e.g. new Messaging Topic(s) has been created or existing Messaging Topic(s) has been deleted.

NOTE 2: If the MSGin5G Server 1 has previously unsubscribed the Messaging Topic list on MSGin5G Server 2, the MSGin5G Server 2 should consider that the MSGin5G Server 1 subscribes the Messaging Topic list on MSGin5G Server 2 for the first time when the MSGin5G Server 1 subscribes the Messaging Topic list again.

6. If Messaging Topic list notification is needed, the MSGin5G Server 2 sends a Messaging Topic list notification to MSGin5G Server 1. The notification includes the information listed in Table 8.8.4.2-3.

Table 8.8.4.2-3: Messaging Topic list notification

Information element	Status	Description
Expiration	O	The new validity date and time of this subscription set by the MSGin5G Server 2.
>Messaging Topic list	M	A list of Messaging Topic(s) that exists on the MSGin5G Server 2. If the MSGin5G Server 1 subscribes the Messaging Topic list on MSGin5G Server 2 for the first time, the MSGin5G Server 2 should include all Messaging Topic(s) that exist on the MSGin5G Server 2 in this Messaging Topic list, else the MSGin5G Server 2 includes the deviation of Messaging Topic(s) since the last notification, Each element in this list contains information as specified in Table 8.8.4.2-4. Based on service policy, the MSGin5G Server 2 may only include a part of Messaging Topic(s) in the notification which are allowed to be subscribed by MSGin5G Server 1.

Table 8.8.4.2-4: Individual Messaging Topic

Information element	Status	Description
Messaging Topic	M	Unique identifier of this Messaging Topic.
Update status	M	Identifies the Messaging Topic is newly created on the MSGin5G Server 2, or newly deleted on the MSGin5G Server 2

7. Upon receiving the Messaging Topic list notification, the MSGin5G Server 1 updates the locally stored Messaging Topic list:
- a) if the Update status of a Messaging Topic is Created, the MSGin5G Server 1 adds the Messaging Topic to the locally stored Messaging Topic list; and
 - b) if the Update status of a Messaging Topic is Deleted,
 - i) if the Messaging Topic exists on MSGin5G Server 1, the MSGin5G Server 1 removes the Messaging Topic from the locally stored Messaging Topic list; and

- ii) if the Messaging Topic does not exist on MSGin5G Server 1, the MSGin5G Server 1 ignores this Messaging Topic update.

NOTE 3: The MSGin5G Server should not send Messaging Topic list notification to other MSGin5G Servers if its locally stored Messaging Topic list is updated by receiving a Messaging Topic list notification.

8.8.4.2a Messaging Topic list unsubscription

Corresponding to message topic list subscription, the MSGin5G Server 1 can unsubscribe the available Messaging Topic list on the MSGin5G Server 2 if it decides to stop to forward the Messaging Topic subscription request to MSGin5G Server 2, or to subscribe to the Messaging Topic on behalf of all MSGin5G UE/Application Server served by it on MSGin5G Server 2, based on decision of service provider.

Figure 8.8.4.2a-1 shows the MSGin5G Server 1 unsubscribing to Messaging Topic list on the MSGin5G Server 2.

Pre-conditions:

1. MSGin5G Server 1 and MSGin5G Server 2 have established a secured connection.
2. The MSGin5G Server 1 has subscribed Messaging Topic list on the MSGin5G Server 2.

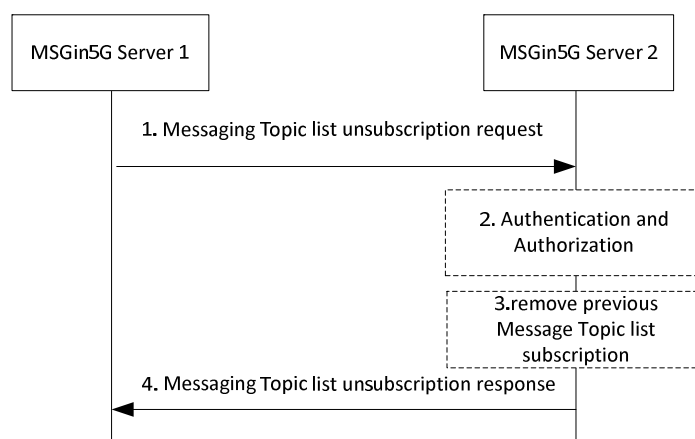


Figure 8.8.4.2a-1: MSGin5G Server 1 unsubscribes to Messaging Topic list on the MSGin5G Server 2

1. The MSGin5G Server 1 sends a Messaging Topic list unsubscription request to the MSGin5G Server 2. The request includes the information elements listed in Table 8.8.4.2a-1.

Table 8.8.4.2a-1: Messaging Topic list unsubscription request

Information element	Status	Description
Originating MSGin5G Server address	M	The MSGin5G Server which requests the unsubscription of the Messaging Topic list.
Recipient MSGin5G Server address	M	The MSGin5G Server which holds the Messaging Topic list.
Security credentials	O	Security information required by the MSGin5G Server 2 and is left for implementation.

2. Upon receiving the Messaging Topic list unsubscription request, the MSGin5G Server 2 validates this request and may verify the security credentials.
3. The MSGin5G Server 2 checks the locally stored Messaging Topic list subscription(s) and removes previous Message Topic list subscription from MSGin5G Server 1.
4. The MSGin5G Server 2 sends a Messaging Topic list unsubscription response to MSGin5G Server 1. The response includes the information listed in Table 8.8.4.2a-2.

Table 8.8.4.2a-2: Messaging Topic list Subscription response

Information element	Status	Description
Subscription status	M	Indicates whether the subscription was successfully deleted on the MSGin5G Server

8.8.4.3 Messaging Topic Subscription between different MSGin5G Servers

If the MSGin5G Server 1 works in Mod.A (see clause 8.8.4.1), upon receiving a Messaging Topic subscription request from MSGin5G Client or Application Server, if the Messaging Topic is included in the Messaging Topic list of MSGin5G Server 2, the MSGin5G Server 1 forwards the Messaging Topic subscription request to MSGin5G Server 2. Otherwise, the MSGin5G Server 1 handles the Messaging Topic subscription request as specified in clause 8.8.3.

If the MSGin5G Server 1 works in Mod.B (see clause 8.8.4.1), upon receiving a Messaging Topic subscription request from MSGin5G Client or Application Server, if the Messaging Topic is not included in the Messaging Topic list of MSGin5G Server 2, the MSGin5G Server 1 handles the Messaging Topic subscription request as specified in clause 8.8.1. Otherwise, it may subscribe one or more Messaging Topic(s) from the Messaging Topic list by using the procedure specified in clause 8.8.1 with the clarification listed below.

The procedure for the Messaging Topic subscription for both Mod. A and Mod. B. between MSGin5G Servers is as follows:

1. The MSGin5G Server 1 includes the information elements listed in Table 8.8.4.3-1 instead of the information elements listed in Table 8.8.1-1.

Table 8.8.4.3-1: Messaging Topic subscription request

Information element	Status	Description
Originating UE Service ID/AS Service ID (see NOTE 1)	O	The service identity of the sending MSGin5G Client or the sending Application Server. This IE shall be included if MSGin5G Server 1 forwards Messaging Topic subscription request from the MSGin5G UE/Application Server served by it to MSGin5G Server 2.
MSGin5G Server address (see NOTE 1)	O	The MSGin5G Server which subscribes the Messaging Topic(s). This IE shall be included if MSGin5G Server 1 subscribe the Messaging Topic on behalf of all MSGin5G UE/Application Server served by it.
Security credentials	O	Security information required by the MSGin5G Server 2 and is left for implementation.
Messaging Topic (see NOTE 2)	M	A list of Messaging Topic(s) that is to be subscribed. The number of Messaging Topic(s) included in this IE can be one or more.
Expiration	O	The date and time when the subscription expires. This date and time apply to all Messaging Topic(s) subscribed in this request. If this IE is included, the value of it should be larger than 0. If this IE is not included, the expiration time is subject to operator policy.
NOTE 1: Only one of these IEs shall be included.		
NOTE 2: The content of the Messaging Topic is out of scope of 3GPP specifications.		

2. Upon receiving the Messaging Topic subscription request, the MSGin5G Server 2 validates this request and may verify the security credentials.
3. The MSGin5G Server 2 handles the Originating UE Service ID/AS Service ID or MSGin5G Server address included in the Messaging Topic subscription request as the UE Service ID/AS Service ID included in Table 8.8.1-1.

8.8.4.4 Messaging Topic Unsubscription between different MSGin5G Servers

If the MSGin5G Server 1 works in Mod.A (see clause 8.8.4.1), and upon receiving a Messaging Topic unsubscription request from MSGin5G Client or Application Server, and if the Messaging Topic is included in the Messaging Topic list of MSGin5G Server 2, the MSGin5G Server 1 forwards the Messaging Topic unsubscription request to MSGin5G Server 2. Otherwise, the MSGin5G Server 1 handles the Messaging Topic unsubscription request as specified in clause 8.8.1.

If the MSGin5G Server 1 works in Mod.B (see clause 8.8.4.1), it may also unsubscribe one or more Messaging Topic(s) from the Messaging Topic list held on MSGin5G Server 2 by using the procedure specified in clause 8.8.3 with the clarification listed below.

The procedure for the Messaging Topic unsubscription for both Mod. A and Mod. B. between MSGin5G Servers is as follows:

1. The MSGin5G Server 1 includes the information elements listed in Table 8.8.4.4-1 instead of the information elements listed in Table 8.8.3-1.

Table 8.8.4.4-1: Messaging Topic unsubscription request

Information element	Status	Description
Originating UE Service ID/AS Service ID (see NOTE 1)	O	The service identity of the sending MSGin5G Client or the sending Application Server. This IE shall be included if MSGin5G Server 1 forwards Messaging Topic unsubscription request from the MSGin5G UE/Application Server served by it to MSGin5G Server 2.
MSGin5G Server address (see NOTE 1)	O	The MSGin5G Server which unsubscribes the Messaging Topic(s). This IE shall be included if MSGin5G Server 1 subscribe the Messaging Topic on behalf of all MSGin5G UE/Application Server served by it.
Security credentials	O	Security information required by the MSGin5G Server 2 and is left for implementation.
Messaging Topic	M	A list of Messaging Topic(s) that is to be unsubscribed. The number of Messaging Topic(s) included in this IE can be one or more.
NOTE 1: Only one of these IEs shall be included.		

2. Upon receiving the Messaging Topic unsubscription request, the MSGin5G Server 2 validates this request and may validate the security credentials.
3. The MSGin5G Server 2 handles the Originating UE Service ID/AS Service ID or MSGin5G Server address included in the Messaging Topic unsubscription request as the UE Service ID/AS Service ID included in Table 8.8.3-1.

8.9 Usage of Network Capabilities

8.9.1 General

The present clause specifies the functionality leveraged by the MSGin5G Service via Core Network exposure.

8.9.2 UE reachability status monitoring

8.9.2.1 General

UE reachability status leverages the 3GPP network monitoring functionality exposed via T8/N33 reference point detailed in 3GPP TS 23.502 [7] and TS 29.522[10]. The MSGin5G Server may use the UE reachability status monitoring by using the 3GPP Network capabilities based on the information, i.e. whether UE reachability status monitoring is needed to be used for this message, received from the Application Server, i.e. based on Information Elements specified in clause 9.1.2.1 or based on the information received from the MSGin5G Client, i.e. based on

Information Elements specified in clause 8.11.4. How (e.g., via request/response or subscription) to monitor the UE reachability using the 3GPP Network capabilities is implementation dependent.

NOTE 1: Use of the UE reachability status monitoring procedure in the application layer has no impact to how the Core Network delivers the message to the UE.

NOTE 2: MSGin5G Service provider policies may indicate whether the UE reachability status monitoring feature is enabled or not.

8.9.2.2 Procedures

8.9.2.2.1 Request-response

Figure 8.9.2.2.1-1 shows the procedure which may be used by the MSGin5G Server to make a request for UE reachability status information.

Pre-conditions:

1. A UE hosts an MSGin5G Client.
2. The MSGin5G Client has registered with the MSGin5G Server and has shared UE contact information.
3. The MSGin5G Server has determined to subscribe for monitoring of UE reachability events in the Core Network, e.g., that the UE is a sleepy node.

NOTE: How the MSGin5G Server subscribes for monitoring of UE reachability events in the Core Network is implementation dependent.

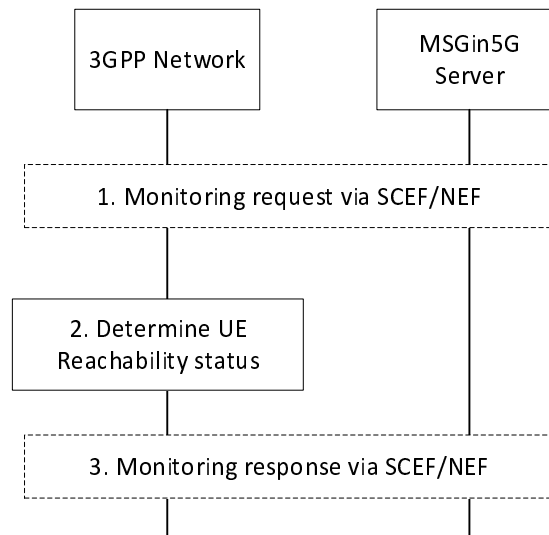


Figure 8.9.2.2.1-1: MSGin5G reachability status request-response.

1. The MSGin5G Server sends a one-time Monitoring Request to the 3GPP Network using SCEF/NEF capabilities.
The one-time Monitoring Request includes monitoring type set to UE_REACHABILITY, Maximum Number of Reports of 1 and does not include the Monitoring Duration IE.
2. The 3GPP network processes the monitoring request and determines the reachability status of the UE(s), as described in 3GPP TS 29.122 [9].

3. If the Monitoring Request is successfully processed, a monitoring response providing the UE(s) reachability status is sent to the MSGin5G Server. The response may include idle mode information e.g., active time granted to the UE, eDRX cycle length, periodic RAU/TAU timer., depending on the parameters indicated in the request.

8.9.2.2.2 Subscribe

Figure 8.9.2.2.2-1 shows the procedure which may be used by the MSGin5G Server to subscribe for monitoring of UE reachability.

Pre-conditions:

1. A UE hosts an MSGin5G Client.
2. The MSGin5G Client has registered with the MSGin5G Server and has shared UE contact information.
3. The MSGin5G Server subscribes for monitoring of UE reachability events in the Core Network, e.g., that the UE is a sleepy node, based on the information, i.e. whether UE reachability status monitoring is needed to be used for this message, received from the Application Server or MSGin5G Client.

NOTE: How the MSGin5G Server subscribes for monitoring of UE reachability events in the Core Network is implementation dependent.

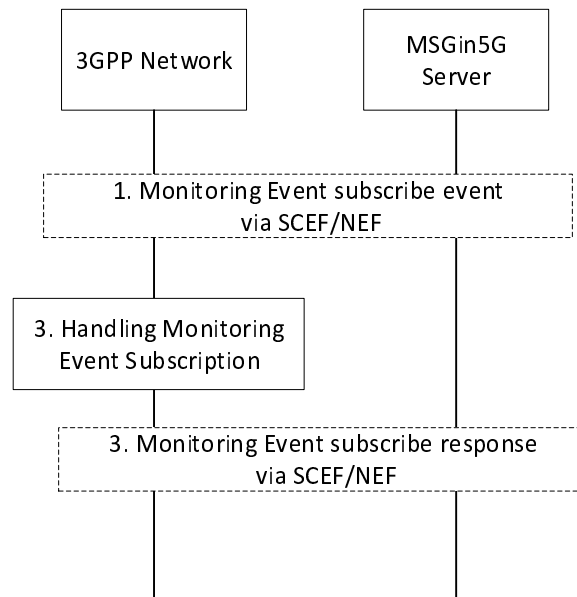


Figure 8.9.2.2.2-1: MSGin5G reachability status subscribe.

1. The MSGin5G Server sends a Monitoring Event Subscribe request to the 3GPP Network using existing SCEF/NEF capabilities.

The Monitoring Event Subscribe is a Monitoring Request with monitoring type set to UE_REACHABILITY, and either the Maximum Number of Reports greater than 1 or the Monitoring Duration IE are included.

3. The 3GPP network processes the Monitoring Event Subscribe request as described in 3GPP TS 29.122 [9].
4. If the Monitoring Event Subscribe Request is successfully processed, a response indicating the request was accepted is sent to the MSGin5G Server.

8.9.2.2.3 Notify

Figure 8.9.2.2.3-1 shows the procedure which may be for updating MSGin5G reachability status.

Pre-conditions:

1. The MSGin5G Server has subscribed for reachability status monitoring for a UE or group of UEs.
2. The monitored UE(s) has transitioned to Connected Mode, Idle Mode or eDRX paging occasion and the 3GPP Network Entities has detected the change in UE reachability status.

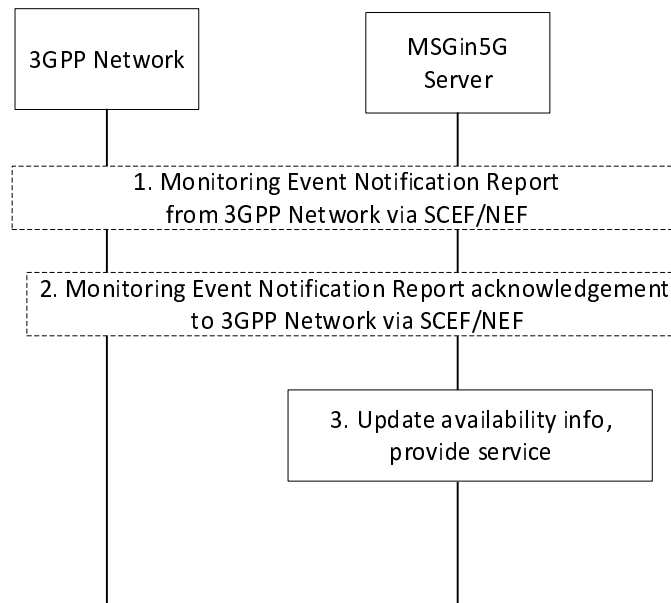


Figure 8.9.2.2.3-1: MSGin5G reachability status notify.

1. Based on the reachability status change of a monitored UE(s), the 3GPP Network sends a Monitoring Notification message for UE reachability to the MSGin5G Server as specified in 3GPP TS 29.122 [9].

The notification may include idle mode information e.g., active time granted to the UE, eDRX cycle length, periodic RAU/TAU timer, depending on the subscription.

2. After receiving a UE Reachability monitoring notification, the MSGin5G Server responds with an acknowledgement of the notification via SCEF/NEF.
3. The MSGin5G Server uses the information provided in the UE reachability monitoring event report to update its information on the UE's availability, e.g., MSGin5G Client Availability information. The MSGin5G Server may provide additional services based on reachability information, e.g., forward a stored message.

8.9.2.2.4 Unsubscribe

Figure 8.9.2.2.4-1 shows the procedure which may be used by the MSGin5G Server to unsubscribe from monitoring of UE reachability.

Pre-conditions:

1. The MSGin5G Server has subscribed for reachability status monitoring for a UE or group of UEs.
2. Later, the MSGin5G Server unsubscribes for monitoring of UE reachability events in the Core Network, based on the information received from the Application Server or MSGin5G Client.

NOTE 1: How the MSGin5G Server subscribes or unsubscribes for monitoring of UE reachability events in the Core Network is implementation dependent.

NOTE 2: If the initial MSGin5G Server subscription for reachability status monitoring reaches the Maximum Number of Reports or Monitoring Duration indicated in the request, the 3GPP Network automatically deletes the subscription and an explicit MSGin5G reachability status unsubscribe is not necessary.

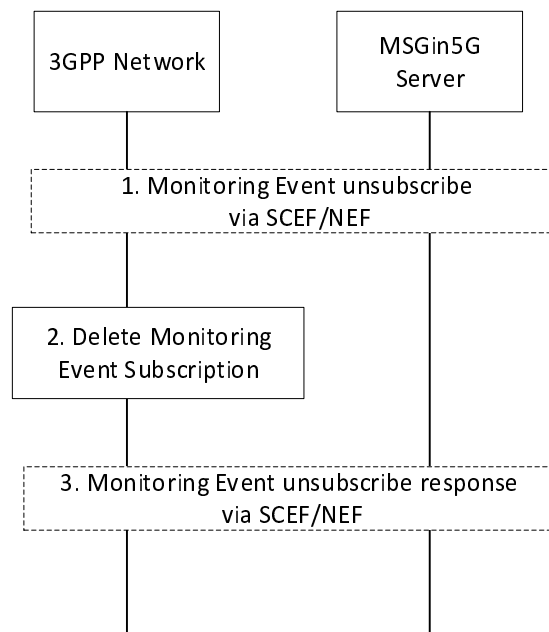


Figure 8.9.2.2.4-1: MSGin5G reachability status unsubscribe.

1. The MSGin5G Server sends a Monitoring event unsubscribe request to the 3GPP Network using existing SCEF/NEF capabilities.
2. The 3GPP network processes the Monitoring event unsubscribe request and deletes the subscription, as described in 3GPP TS 29.122 [9].
3. If the Monitoring event unsubscribe request is successfully processed, a response indicating the subscription was deleted is sent to the MSGin5G Server via SCEF/NEF.

8.9.2.3 Flows

The following information flows are specified for UE reachability status monitoring:

- UE Reachability monitoring request and response;
- UE Reachability monitoring subscribe and unsubscribe
- UE Reachability monitoring notify

All UE reachability monitoring interactions from MSGin5G Server (acting as SCS/AS) to SCEF/NEF occur over T8/N33 reference points capabilities detailed in 3GPP TS 23.502 [7] and TS 29.522[10]. As specified in TS 29.522[10] clause 4.4.2, all UE Reachability monitoring procedures use APIs specified in TS 23.682 [8] clause 5.6.1.4 and 3GPP TS 29.122 [9] clause 4.4.2.2.

8.9.3 MSGin5G device triggering

8.9.3.1 General

MSGin5G device triggering is the means by which an MSGin5G Server leverages the 3GPP network device triggering capabilities, exposed via T8 /N33 reference point, while attempting to deliver an MSGin5G message. For example, when an Application Server initiates an MSGin5G message request, but the target MSGin5G UE is not reachable, the

MSGin5G Server may use the 3GPP network device triggering mechanism to wake up the device and then deliver the payload to the destination.

8.9.3.2 Procedure

Figure 8.9.3.2-1 shows the MSGin5G device triggering procedure.

Pre-conditions:

- 1. The target UE is an MSGin5G UE.
- 2. The target MSGin5G Client is registered with the MSGin5G Server.
- 3. At a later time, after the registration is completed, the MSGin5G UE has become unreachable by the MSGin5G Server.

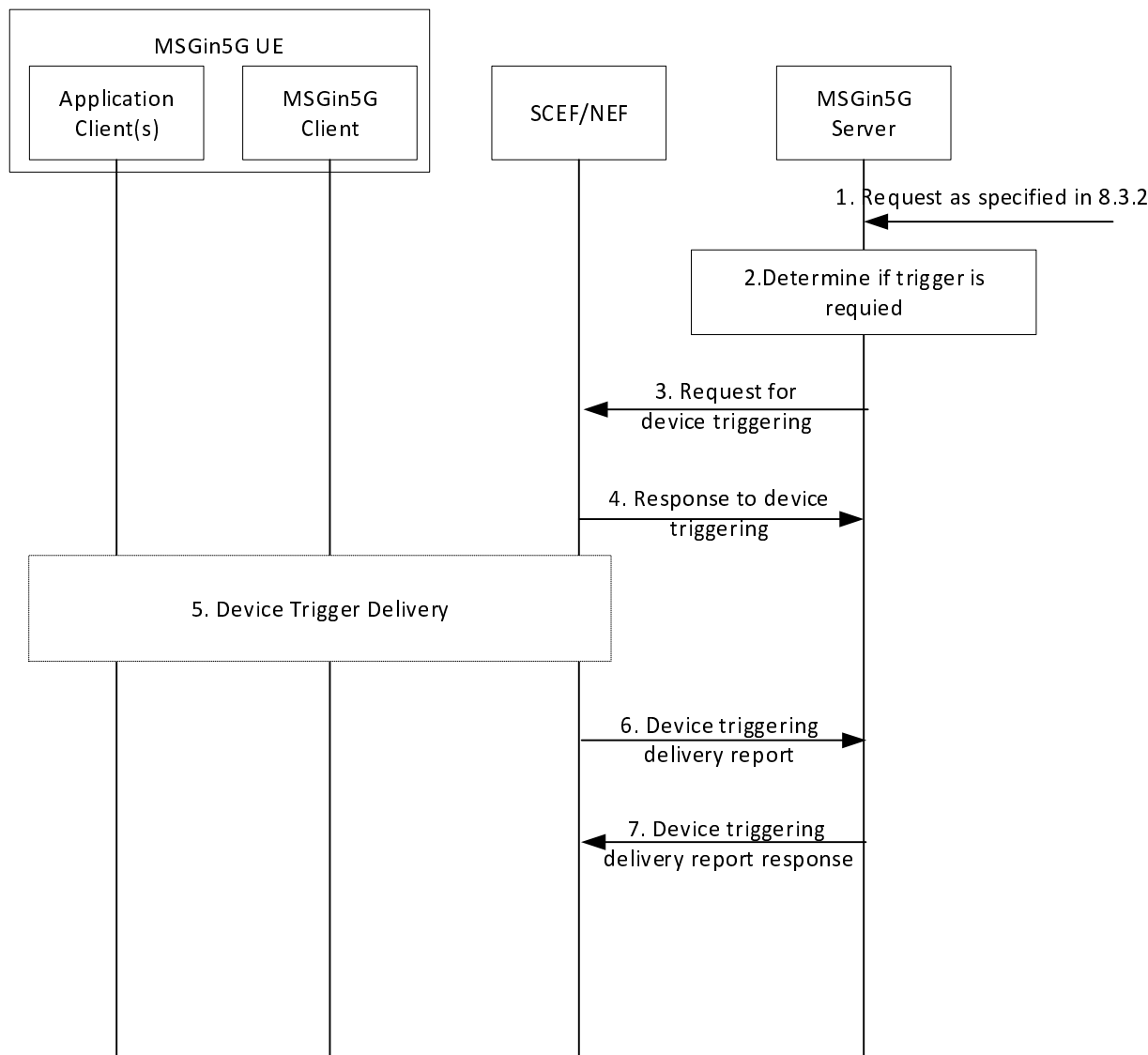


Figure 8.9.3.2-1: MSGin5G Triggering Procedure

- 1. The MSGin5G Server receives a request for sending an MSGin5G message, the request includes the IEs as detailed in clause 9.1.2.1.
- 2. If the MSGin5G Server determines that the recipient MSGin5G Client is not reachable, it initiates a device trigger request via the SCEF/NEF.

To determine the reachability of the target MSGin5G UE, the MSGin5G Server may use the UE reachability status monitoring procedure in clause 8.9.2. The MSGin5G Server may also use availability information provided by the MSGin5G Client at registration in the MSGin5G Client Communication Availability IE, as detailed in Table 8.2.1-1.

NOTE 1: How the MSGin5G Server uses the MSGin5G Client Communication Availability IE, the UE reachability status monitoring procedure, or a combination thereof to make this determination is implementation specific.

NOTE 2: If the recipient MSGin5G Client is reachable then the trigger request is not required, the MSGin5G Server sends the MSGin5G message as detailed in clause 8.3.3 and the rest of the steps in this procedure are skipped.

3. The MSGin5G Server sends a request for Device Triggering via SCEF/NEF and determines the flow as detailed in clause 8.9.3.2. The Device Triggering request uses the UE Identifier, port number(s) and associated protocol information provided by the MSGin5G Client at registration in the MSGin5G Client Triggering Information IE.

The MSGin5G Server may use MSGin5G Client Communication Availability and/or pre-configured information to determine the timing of the Device Triggering request, e.g. the trigger may be sent to ensure that the target UE is reachable prior to resuming MSGin5G communications.

4. The MSGin5G Server receives a response from SCEF/NEF indicating the success or failure status of the request, as detailed in clause 8.9.3.3.
5. The device trigger is delivered to the target via SCEF/NEF and the Core Network. The targeted MSGin5G Client or Application Client receives the device trigger request. The targeted MSGin5G Client or Application Client parses the payload of the trigger request and determines the device trigger purpose. The target UE becomes reachable, and the MSGin5G Client or Application Client becomes available for further MSGin5G communications.
6. The MSGin5G Server receives a Device Triggering delivery status report from SCEF/NEF indicating the success of the delivery, as detailed in clause 8.9.3.3.
7. The MSGin5G Server send a Device Triggering delivery status report response to SCEF/NEF to acknowledge the delivery status report, as detailed in clause 8.9.3.3.

Based on the trigger purpose derived from the payload, the targeted MSGin5G Client performs the corresponding actions (e.g. establish access network connectivity, contact the Application Server).

8.9.3.3 Flows

The following information flows are specified for MSGin5G triggering:

1. request for device triggering;
2. response to device triggering;
3. device triggering delivery report; and
4. device triggering delivery report response.

All device triggering interactions from MSGin5G Server (acting as SCS/AS) to SCEF/NEF occur over T8/N33 reference points, using capabilities detailed in 3GPP TS 23.502 [7] and TS 29.522[10]. As specified in TS 29.522[10] clause 4.4.3, all device triggering flows use APIs specified in TS 23.682 [8] clause 5.17.1 and 3GPP TS 29.122 [9] clause 4.4.6.

8.10 Usage of SEAL

8.10.1 General

The MSGin5G Service functional entities MSGin5G Client and MSGin5G Server utilize the SEAL services. All SEAL services specified in 3GPP TS 23.434 [5] are available to MSGin5G Service. In this clause, only the details of the information flows, procedures and APIs whose utilization by MSGin5G Service are well-known are described.

8.10.2 Configuration management service

8.10.2.1 General

The MSGin5G Service functional entities MSGin5G Client and MSGin5G Server utilize configuration management service procedures of SEAL to support MSGin5G Service.

8.10.2.2 Information flows

The following information flows of Configuration Management service are applicable for the MSGin5G Service:

- Get VAL UE configuration request specified in subclause 11.3.2.1 of 3GPP TS 23.434 [5];
- Besides the IEs specified in subclause 11.3.2.1 of 3GPP TS 23.434 [5], the information in table 8.10.2.2-1 is also included in the Get VAL UE configuration request.

Table 8.10.2.2-1: Additional information in the Get VAL UE configuration request

Information element	Status	Description
MSGin5G UE information	O	Other information needed by the configuration procedure. (NOTE)
NOTE: The information can be the device type, device Vendor, etc. It is specified by application provider or MSGin5G Service provider and is out of scope of this document. The MSGin5G Service provider can configure the MSGin5G UE with different configuration data based on this IE. E.g. all sensors can be configured to a same MSGin5G Server.		

- Get VAL UE configuration response specified in subclause 11.3.2.2 of 3GPP TS 23.434 [5];
- Besides the IEs specified in subclause 11.3.2.2 of 3GPP TS 23.434 [5], the information in table 8.10.2.2-2 is also included in the Get VAL UE configuration response.

Table 8.10.2.2-2: Additional information in the Get VAL UE configuration response

Information element	Status	Description
UE service ID	M	MSGin5G Service ID assigned to the requesting MSGin5G UE.
MSGin5G Server address	M	The MSGin5G Server which serves this MSGin5G UE.
MSGin5G Service specified information	O	The specific information of the MSGin5G Service specified by the MSGin5G Service provider. (NOTE)
NOTE: E.g. the segment size of MSGin5G message in this service provider, the detailed definition is out of scope of this document.		

The usage of the above information flows is clarified as below:

- The VAL UE ID is the MSGin5G UE ID;
- VAL service ID is the service identifier of the MSGin5G Service; and
- VAL UE configuration data is the MSGin5G UE configuration data.

8.10.2.3 Procedures

The following procedures of configuration management service are applicable for the MSGin5G Service:

- VAL UE configuration data specified in subclause 11.3.3 of 3GPP TS 23.434 [5].

8.10.3 Group management service

8.10.3.1 General

The MSGin5G Service functional entities MSGin5G Client and MSGin5G Server utilize SEAL Client and SEAL Server for the group management service (e.g. creation, join, leave) on the group configuration information (e.g. group join policy, group leader) provided by the MSGin5G Server. The decisions and corresponding triggers (e.g. group creation, join, leave and deletion) for group management are responsibility of the application leveraging MSGin5G Service. The group management service of SEAL provides support for creating group for MSGin5G Service for applications leveraging MSGin5G Service.

8.10.3.2 Information flows

The information flows of group management procedures are specified in 3GPP TS 23.434 [5].

8.10.3.3 Procedures

The following procedures of group management service of SEAL as specified in 3GPP TS 23.434 [5] are applicable for the MSGin5G Service:

- Group creation specified in clause 10.3.3;
 - Subsequent to Step 3, when the identity list with the list of VAL user IDs or VAL UE IDs that are part of the created group contain the list of VAL user IDs or VAL UE IDs which does not have group management client (e.g. Legacy 3GPP UEs, Non-3GPP UEs or Application Server), it is responsibility of the VAL server (MSGin5G Server) to initiate the group creation notification towards those UEs.
- Group membership update specified in clause 10.3.5.2;
- Group configuration management specified in clause 10.3.6;
- Location-based group creation specified in clause 10.3.7;
- Group announcement and join specified in clause 10.3.8;
- Group member leave specified in clause 10.3.9;
- Temporary groups specified in clause 10.3.10;
- Group deletion specified in clause 10.3.13.

NOTE: If the UE that is involved the Group management procedures does not have group management client (e.g. Legacy 3GPP UEs, Non-3GPP UEs or Application Server), it is responsibility of the VAL server (MSGin5G Server) to initiate the necessary group management request/response towards SEAL Group Management server on behalf of those UE. And if applicable, send and receive the necessary group management request/response to/from those UEs.

8.10.3.4 APIs

The following APIs of group management service of SEAL as specified in 3GPP TS 23.434 [5] are applicable for the MSGin5G Service:

- SS_GroupManagement API specified in clause 10.4.2;
- SS_Group_Management_Event API specified in clause 10.4.5.

8.11 Application Client resides different UE in MSGin5G Service

8.11.1 General

This clause specifies the procedures for an Application Client residing on a different UE-2 than the UE with the MSGin5G Client (resides on MSGin5G UE-1) to perform Application Client registration, to send messages and receive messages using MSGin5G Client. The communication between Application Client and MSGin5G Client is over MSGin5G-5 reference point.

NOTE 1: The procedure in this clause is also applicable to UE-2 that is out of network coverage.

NOTE 2: The APIs provided by the MSGin5G Client to the Application Client are implementation specific in this release.

NOTE 3: When the Application Client resides in MSGin5G UE-1, the interaction between them can also be implementation specific.

8.11.2 Application Client registration using MSGin5G Client

The signalling flow for registration of Application Client on the UE-2 with MSGin5G Client on MSGin5G UE-1 to use MSGin5G service is illustrated in figure 8.11.2-1.

Pre-conditions:

1. The MSGin5G UE-1 is configured with information to recognize and authorize UE-2.
2. The Application Client on UE-2 has discovered or is configured that the MSGin5G Client resides on MSGin5G UE-1 and can provide the MSGin5G service capability to it.
3. The UE-2 is using NR-PC5 to communicate with MSGin5G UE-1.

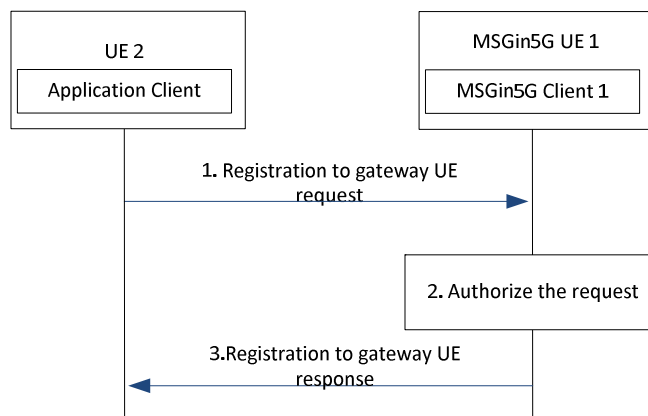


Figure 8.11.2-1: Registration of Application Client on UE-2 with MSGin5G Client on MSGin5G UE-1

- 1) An Application Client on the UE-2 registers with MSGin5G Client-1 in MSGin5G UE-1 to use MSGin5G service. The request message includes information elements as specified in Table 8.11.2-1.

Table 8.11.2-1: Information elements for Registration to gateway UE request

Information element	Status	Description
Layer-2 ID	M	Layer-2 identity of UE-2
Application ID	M	Application ID of the application client on UE-2
Credential information	M	UE-2 credential information

NOTE 1: The security parameters to include in the message between UE-2 and MSGin5G UE-1 are implementation specific in this release.

NOTE 2: The Registration to gateway UE request and Registration to gateway UE response in Figure 8.11.2-1, Table 8.11.2-1 and Table 8.11.2-2 are used between Application Client and MSGin5G Client. They are not used in the interaction between MSGin5G Client and MSGin5G Gateway Client.

- 2) Upon receiving the request from the Application Client, the MSGin5G Client authorizes the Application Client on UE-2 to it for MSGin5G service. The MSGin5G Client assigns a Registration ID and stores the mapping of the Registration ID, Application ID and Layer-2 ID of the UE-2.

NOTE 3: The MSGin5G Client may reject the request for registration to use it for MSGin5G service based on local condition (like available power or connectivity to access network or any other reason outside the scope of 3GPP).

- 3) The MSGin5G Client sends a response to the Application Client. The response message includes information elements as specified in Table 8.11.2-2.

Table 8.11.2-2: Information elements for Registration to gateway UE response

Information element	Status	Description
Result	M	Indicates success or failure of the request
Registration ID	O	Identifies registration. This IE is included only if Result IE is set to success.
Failure reason	O	Indicates failure reason. This IE is included only if Result IE is set to failure.

NOTE 4: If the MSGin5G Client decided to reject the request for registration or if authorization fails in step 2, the MSGin5G Client sends a failure response to the Application Client. Otherwise, the MSGin5G Client sends a success response to the Application Client.

NOTE 5: The MSGin5G Client may provide MSGin5G service capabilities for multiple Application Clients, at the same time.

8.11.3 Application Client de-registration using MSGin5G Client

The signalling flow for deregistration of Application Client on the UE-2 with MSGin5G Client-1 on MSGin5G UE-1 is illustrated in figure 8.11.3-1.

Pre-conditions:

1. The Application Client on UE-2 is successfully registered with MSGin5G Client on MSGin5G UE-1.

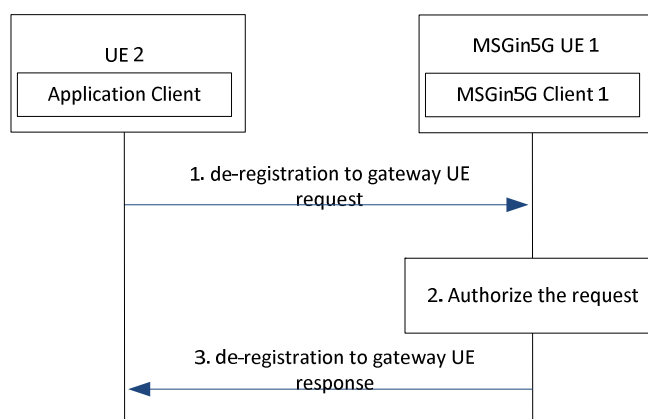


Figure 8.11.3-1: Deregistration of Application Client on UE-2 with MSGin5G Client on MSGin5G UE-1

- 1) An Application Client on the UE-2 deregisters with MSGin5G Client in MSGin5G UE-1 to discontinue usage of the MSGin5G Service. The request message includes information elements as specified in Table 8.11.3-1.

Table 8.11.3-1: Information elements for Deregistration to gateway UE request

Information element	Status	Description
Registration ID	M	Identifies the registration
Credential information	M	UE-2 credential information

- 2) Upon receiving the request from the Application Client, the MSGin5G Client removes the mapping of Registration ID, Application ID and Layer-2 ID of the UE-2. The MSGin5G Client sends a response to the Application Client on UE-2. The response message includes the information elements as specified in Table 8.11.3-2.

Table 8.11.3-2: Information elements for Deregistration to gateway UE response

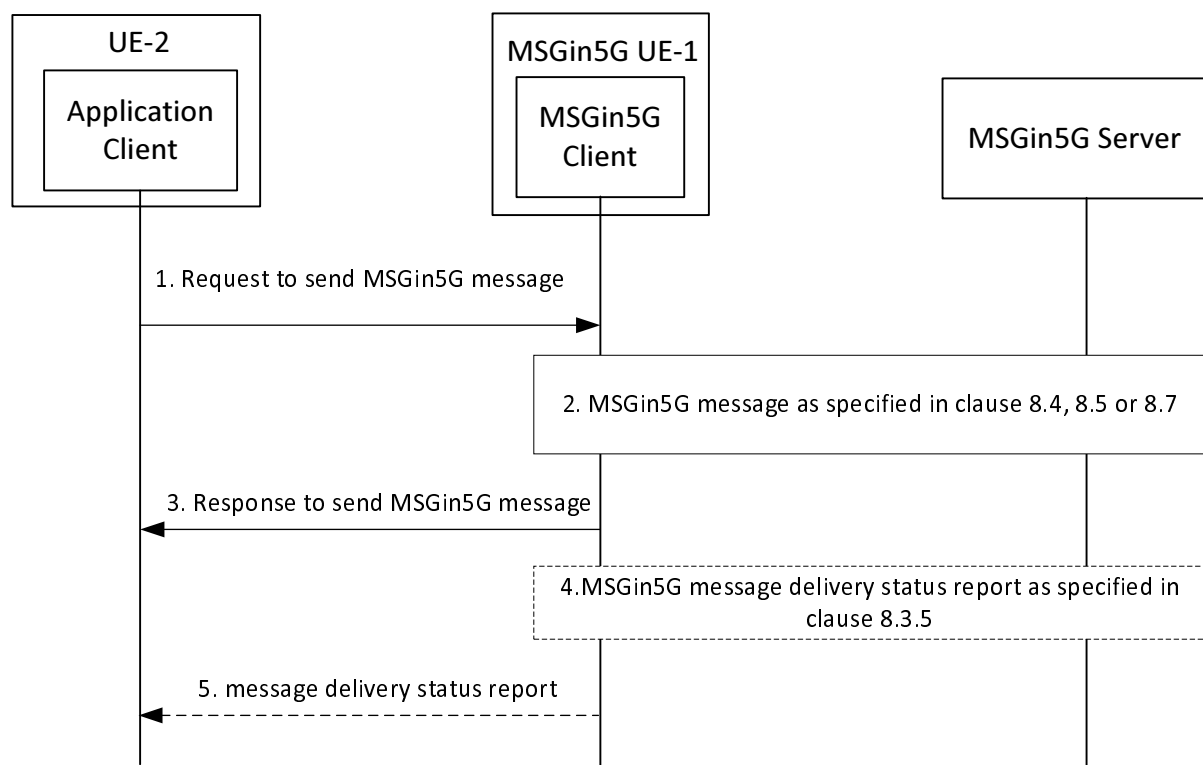
Information element	Status	Description
Result	M	Indicates success or failure of the request
Failure reason	O	Indicates failure reason. This IE is included only if the Result IE is set to failure.

8.11.4 Application Client sending a message using MSGin5G Client on another UE

The signalling flow for the Application Client on the UE-2 to send a message using the MSGin5G Client on MSGin5G UE-1 is illustrated in figure 8.11.4-1.

Pre-conditions:

1. The MSGin5G UE-1 is connected to an access network that provides connectivity to the MSGin5G Server.
2. The Application Client on UE-2 is successfully registered with MSGin5G UE-1 to use MSGin5G service.

**Figure 8.11.4-1: Application Client on UE-2 sends message using MSGin5G Client on MSGin5G UE-1**

- 1) An Application Client on the UE-2 sends a request to send MSGin5G message to the MSGin5G Client. The information elements defined in Table 8.11.4-1 are included in the message.

Table 8.11.4-1: Information elements for Request to send MSGin5G message

Information element	Status	Description
Recipient UE Service ID or AS Service ID (see NOTE)	O	The service identity of the recipient. This IE is mandatory to initiate Point-to-Point messaging and Point-to-AS messaging.
Group Service ID (see NOTE)	O	The service identifier of the target MSGin5G Group. This IE is mandatory to initiate Group messaging.
Broadcast Area ID (see NOTE)	O	The service identifier of the Broadcast Service Area where the message needs to be broadcast. This IE is mandatory in the Broadcast Message.
Messaging Topic (see NOTE)	O	Indicates which Messaging Topic this message is related to. This IE is mandatory for a message distribution based on topic.
Application ID	O	Identifies the application(s) for which the payload is intended.
Payload	M	Payload of the message. MSGin5G Server/Client is unaware of the content.
Delivery status required	O	Indicates whether delivery status is required or not.
Priority type	O	Application priority level requested for this message as specified in Table 8.3.2-1.
NOTE: Only one occurrence shall be present of any of these IEs.		

- 2) Upon receiving the request from the Application Client in UE-2, the MSGin5G Client constructs an MSGin5G message with the related IEs specified in table 8.3.2-1 and sends the MSGin5G message.
- a) if the size of the received message exceeds the maximum allowed packet size, the MSGin5G Client sends the message as specified in clause 8.5; or
 - b) If the size of the received message does not exceed the maximum allowed packet size, the MSGin5G Client sends the message as specified in clause 8.7.; or
 - c) If the size of the received message does not exceed the maximum allowed packet size, the MSGin5G Client may apply message aggregation as specified in clause 8.4 before sending the message as specified in clause 8.7.

NOTE 1: The MSGin5G Client may also reject the request to send the MSGin5G message based on local condition (like available power or connectivity to access network or any other reason outside the scope of 3GPP).

- 3) The MSGin5G Client sends a response to Application Client on UE-2. The response message includes the information elements as specified in Table 8.11.4-2.

Table 8.11.4-2: Information elements for Response to send MSGin5G message

Information element	Status	Description
UE Service ID or AS Service ID or Group Service ID or Broadcast Area ID or Message Topic	M	The service identifier that the message is sent
Result	M	Indicates success or failure of the request
Failure reason	O	Indicates failure reason. This IE is included only if Result IE is set to failure.

NOTE 2: If the MSGin5G Client has decided to reject the request to send the message or the MSGin5G Client received a reject response from the MSGin5G Server in step 2, the MSGin5G Client sends a failure response to the Application Client and stops performing further steps.

- 4) If delivery status is requested in the message in step 1, the MSGin5G Client may receive MSGin5G message delivery status report from the MSGin5G Server.

- 5) Upon receiving the MSGin5G message delivery status report, the MSGin5G Client sends the message delivery status report to the Application Client on UE-2. The message delivery status report includes information elements as specified in Table 8.11.4-3.

Table 8.11.4-3: Information elements for MSGin5G message delivery status

Information element	Status	Description
UE Service ID or AS Service ID	M	The service identifier that sends the message delivery status
Delivery status	M	Indicates delivery status

8.11.5 Application Client receiving message via MSGin5G Client on another UE

The signalling flow for an Application Client on the UE-2 to receive a message using the MSGin5G Client on MSGin5G UE-1 is illustrated in figure 8.11.5-1.

Pre-conditions:

1. The MSGin5G UE-1 is connected to an access network that provides connectivity to the MSGin5G Server.
2. The Application Client on UE-2 is successfully registered with MSGin5G UE-1 to use MSGin5G service.

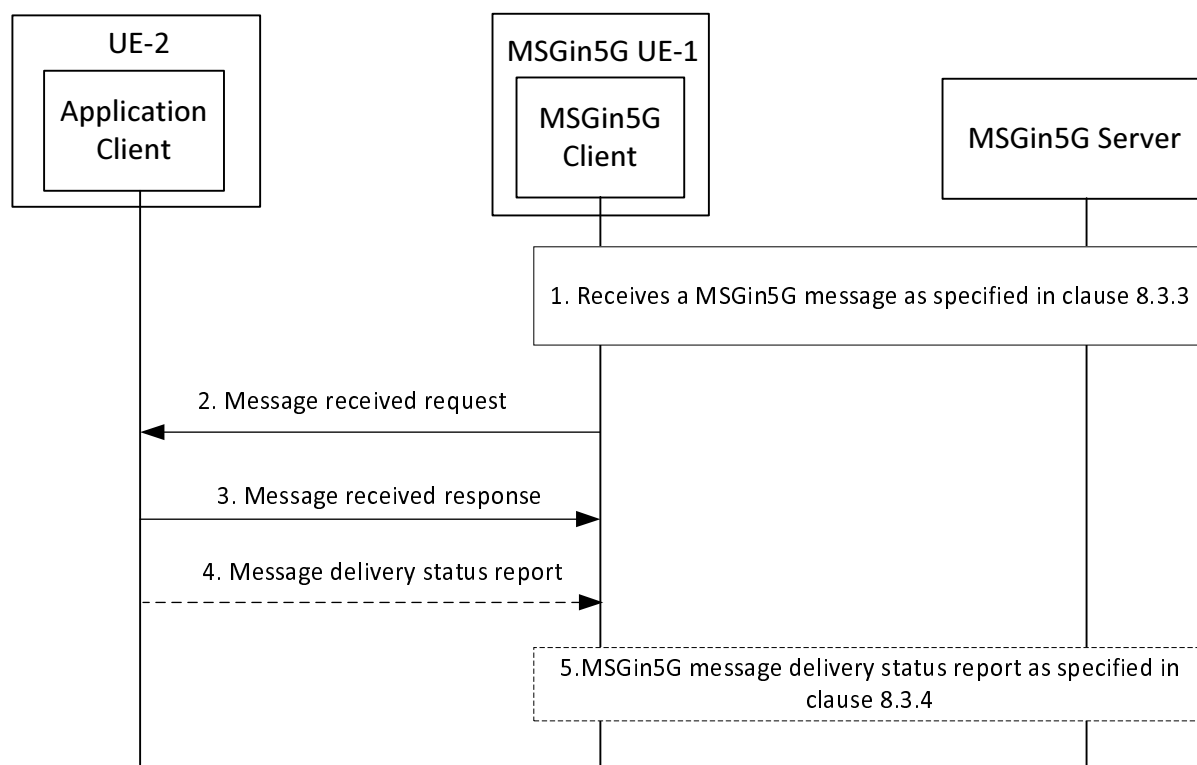


Figure 8.11.5-1: Application Client on UE-2 receives message using MSGin5G Client on MSGin5G UE-1

- 1) The MSGin5G Client receives an MSGin5G message as specified in clause 8.3.3 for the Application Client on UE-2. The MSGin5G Client performs reassembly if the received message is part of a segmented message and waits till the whole message is received. The MSGin5G Client may also perform the segment recovery procedure as specified in clause 8.5.4 to recover missing segments.
- 2) Upon successfully receiving a message for the Application Client on UE-2, the MSGin5G Client sends a message received request to the Application Client based on the Application ID in the received message. The message includes information elements as specified in Table 8.11.5-1.

Table 8.11.5-1: Information elements for Message received request

Information element	Status	Description
Recipient UE Service ID/AS Service ID (see NOTE)	O	The service identifier of the originator. This IE is mandatory for Point-to-Point messaging and AS-to-Point messaging.
Group Service ID (see NOTE)	O	The service identifier of the MSGin5G Group. This IE is mandatory for Group Message.
Messaging Topic (see NOTE)	O	Indicates the Topic for which the message is received. This IE is mandatory for a Topic Message.
Payload	M	Payload of the message. MSGin5G Server/Client is unaware of the content.
Delivery status required	O	Indicates whether delivery status is required or not.
Priority type	O	Application priority level requested for this message as specified in Table 8.3.2-1.
NOTE: Only one occurrence shall be present of any of these IEs.		

- 3) Upon successfully receiving the message, the Application Client on UE-2 sends the message received response to the MSGin5G Client.
- 4) If delivery status is requested in the received message, the Application Client on UE-2 sends the message delivery status to the MSGin5G Client.
- 5) Upon receiving the delivery status, the MSGin5G Client constructs the MSGin5G message delivery status report as specified in table 8.3.4-1 and sends it to the MSGin5G Server.

9 APIs and related information flows

9.1 APIs provided by MSGin5G Server

9.1.1 Mm5s APIs

9.1.1.1 M5S_AS_Originating_Message_Delivery API

9.1.1.1.1 General

API description: This API enables the Application Server to send MSGin5G message to the MSGin5G Server.

9.1.1.1.2 Send_MSGin5G_Message operation

API operation name: Send_MSGin5G_Message

Description: Send an MSGin5G message to MSGin5G Server.

Known Consumers: Application Server

Inputs: Refer subclause 9.1.2.1

Outputs: Refer subclause 8.3.2

See subclause 8.3.2 for the details of usage of this API operation.

9.1.1.2 M5S_UE_Originating_Message_Delivery API

9.1.1.2.1 General

API description: This API enables the Message Gateway or other 5GS Function to deliver MSGin5G message to the MSGin5G Server.

9.1.1.2.2 Send_MSGin5G_Message operation

API operation name: Send_MSGin5G_Message

Description: Send an MSGin5G message to MSGin5G Server.

Known Consumers: L3G, N3G.

Inputs: Refer subclause 8.3.2

Outputs: Refer subclause 8.3.2

See subclause 8.3.2 for the details of usage of this API operation.

9.1.1.3 M5S_AS_Originating_Delivery_Status_Report API

9.1.1.3.1 General

API description: This API enables the Application Server to delivery MSGin5G message delivery status report to the MSGin5G Server.

9.1.1.3.2 Report_Message_Delivery_Status operation

API operation name: Report_Message_Delivery_Status

Description: Send an MSGin5G message delivery status report to MSGin5G Server.

Known Consumers: Application Server

Inputs: Refer subclause 9.1.2.2

Outputs: Refer subclause 8.3.4

See subclause 8.3.4 for the details of usage of this API operation.

9.1.1.4 M5S_Delivery_Status_Report API

9.1.1.4.1 General

API description: This API enables the Message Gateway to deliver MSGin5G message delivery status reports to the MSGin5G Server.

9.1.1.4.2 Report_Message_Delivery_Status operation

API operation name: Report_Message_Delivery_Status

Description: Send an MSGin5G message delivery status report to MSGin5G Server.

Known Consumers: L3G, N3G, BMG.

Inputs: Refer subclause 8.3.4

Outputs: Refer subclause 8.3.4

See subclause 8.3.4 for the details of usage of this API operation.

9.1.1.5 M5S_AS_Registration API

9.1.1.5.1 General

API description: This API enables the Application Server to register to MSGin5G Server.

9.1.1.5.2 Registration operation

API operation name: Registration

Description: Do registration or update registration to an MSGin5G Server, by using this API, the Application Server provides/updates its information, including the URL used for the message delivery from MSGin5G Server to Application Server.

Known Consumers: Application Server

Inputs: Refer subclause 9.1.2.3

Outputs: Refer subclause 9.1.2.4

9.1.1.5.3 Deregistration operation

API operation name: Send_MSGin5G_Message

Description: Do deregistration with an MSGin5G Server.

Known Consumers: Application Server

Inputs: Refer subclause 9.1.2.5

Outputs: Refer subclause 9.1.2.6

9.1.1.6 M5S_Topiclist_Event API

9.1.1.6.1 General

API description: This API enables another MSGin5G Server to communicate with the MSGin5G Server to subscribe and receive subsequent notification events of the Messaging Topic list and information of specific message topics on the MSGin5G Server.

9.1.1.6.2 Subscribe Messaging Topiclist operation

API operation name: Subscribe_Messaging_Topiclist

Description: Subscribing to changes to Messaging Topic list on the MSGin5G Server.

Known Consumers: MSGin5G Server

Inputs: Refer subclause 8.8.4.2

Outputs: Refer subclause 8.8.4.2

See subclause 8.8.4.2 for the details of usage of this API operation

9.1.1.6.3 Notify Messaging Topiclist operation

API operation name: Notify_Messaging_Topiclist

Description: Notification for changes to Messaging Topic list on the MSGin5G Server.

Known Consumers: MSGin5G Server

Inputs: Refer subclause 8.8.4.2

Outputs: Refer subclause 8.8.4.2

See subclause 8.8.4.2 for the details of usage of this API operation

9.1.1.6.4 Subscribe Messaging Topic operation

API operation name: Subscribe_Messaging_Topic

Description: Subscribing to changes to one or more specific Messaging Topic(s) on the MSGin5G Server.

Known Consumers: MSGin5G Server

Inputs: Refer subclause 8.8.4.3

Outputs: Refer subclause 8.8.4.3

See subclause 8.8.4.3 for the details of usage of this API operation

9.1.1.6.5 Notify Messaging Topic operation

API operation name: Notify_Messaging_Topic

Description: Notification for changes to one or more specific Messaging Topic(s) on the MSGin5G Server.

Known Consumers: MSGin5G Server

Inputs: Refer subclause 8.8.4.3

Outputs: Refer subclause 8.8.4.3

See subclause 8.8.4.3 for the details of usage of this API operation

9.1.1.6.6 Unsubscribe Messaging Topiclist operation

API operation name: Unsubscribe_Messaging_Topiclist

Description: Unsubscribing to changes to Messaging Topic list on the MSGin5G Server.

Known Consumers: MSGin5G Server

Inputs: Refer subclause 8.8.4.2a

Outputs: Refer subclause 8.8.4.2a

See subclause 8.8.4.2 for the details of usage of this API operation

9.1.1.6.7 Unsubscribe Messaging Topic operation

API operation name: Unsubscribe_Messaging_Topic

Description: Unsubscribing to changes to one or more specific Messaging Topic(s) on the MSGin5G Server.

Known Consumers: MSGin5G Server

Inputs: Refer subclause 8.8.4.4

Outputs: Refer subclause 8.8.4.4

See subclause 8.8.4.4 for the details of usage of this API operation

9.1.2 Mm5s Information flows

9.1.2.1 M5S Application Server originating message send request

The information flows from the Application Server to the MSGin5G Server for message delivery includes the IEs in table 8.3.2-1. Additionally, the following information in table 9.1.2.1-2 elements needs to be included:

Table 9.1.2.1-2: M5S Northbound Message Delivery Send request

Information element	Status	Description
Latency	O	The latency requirement for the message.
Authorization Information	O	The authorization information used to determine whether the Application Server is allowed to send the message

9.1.2.2 M5S Application Server originating message delivery status report request

The information flows from the Application Server to the MSGin5G Server for message delivery status report includes the IE in table 8.3.4-1, and the following information in table 9.1.2.2-1 elements needs to be included:

Table 9.1.2.2-1: M5S Northbound Message Delivery Send request

Information element	Status	Description
Authorization Information	O	The authorization information used to determine whether the Application Server is allowed to send the message

9.1.2.3 M5S Application Server registration request

The information flows from the Application Server to the MSGin5G Server for registration request includes the information elements in Table 9.1.2.3-1.

Table 9.1.2.3-1: Application Server Registration request

Information element	Status	Description
AS service ID	M	The MSGin5G identifier of the Application Server. This ID is configured before registration.
Application ID	O	The identifier of the application specified by the application provider.
Authorization Information	O	The authorization information used to determine whether the Application Server is allowed to send the message
Notification target URI	O	The URL for receiving message, message delivery status report. The MSGin5G Server uses this URL to interact to Application Server.
Requested expiration time	O	Requested expiration time for the registration.
Application Profile (NOTE)	O	The elements in Application Profile include the information of the Application Server, e.g. application name, application provider, application scenario description, application category. This IE is used by MSGin5G Server to compare with application client information.
NOTE: The detailed definition of Application Profile is out of scope of this document.		

9.1.2.4 M5S Application Server registration response

The information flows from the MSGin5G Server to the Application Server for registration response includes the information elements in Table 9.1.2.4-1.

Table 9.1.2.4-1: Application Server registration response

Information element	Status	Description
AS service ID	M	The MSGin5G identifier of the Application Server.
Registration result	M	Indication if the registration is success or failure
Registration expiration time (see NOTE 1)	O	Indicates the expiration time of the registration.
Failure Cause (see NOTE 2)	O	The reason for failure
NOTE 1: This IE shall only be present when the Registration is Success.		
NOTE 2: This IE shall only be present when the Registration result is Failure.		

9.1.2.5 M5S Application Server de-registration request

The information flows from the Application Server to the MSGin5G Server for de-registration request includes the information elements in Table 9.1.2.5-1.

Table 9.1.2.5-1: Application Server de-registration request

Information element	Status	Description
AS service ID	M	The MSGin5G identifier of the Application Server.

9.1.2.6 M5S Application Server de-registration response

The information flows from the MSGin5G Server to the Application Server for de-registration response includes the information elements in Table 9.1.2.6-1.

Table 9.1.2.6-1: Application Server de-registration response

Information element	Status	Description
AS service ID	M	The MSGin5G identifier of the Application Server.
De-registration result	M	Indication if the de-registration is success or failure
Failure Cause (see NOTE)	O	The reason for failure
NOTE: This IE shall only be present when the de-registration result is Failure.		

9.2 APIs provided by Message Gateway

9.2.1 MI3g APIs

9.2.1.1 L3G_Message_Delivery API

9.2.1.1.1 General

API description: This API enables the MSGin5G Server to deliver MSGin5G message to the Legacy 3GPP Message Gateway.

9.2.1.1.2 Send_Message operation

API operation name: Send_MSGin5G_Message

Description: Send an MSGin5G message to Legacy 3GPP Message Gateway.

Known Consumers: M5S.

Inputs: Refer subclause 8.3.3

Outputs: Refer subclause 8.3.3

See subclause 8.3.3 for the details of usage of this API operation.

9.2.1.2 L3G_Delivery_Status_Report API

9.2.1.2.1 General

API description: This API enables the MSGin5G Server to deliver a Delivery Status Report to the Legacy 3GPP Message Gateway.

9.2.1.2.2 Report_Message_Delivery_Status operation

API operation name: Report_Message_Delivery_Status

Description: Send an MSGin5G message delivery status report to Legacy 3GPP Message Gateway.

Known Consumers: M5S.

Inputs: Refer subclause 8.3.5

Outputs: Refer subclause 8.3.5

See subclause 8.3.5 for the details of usage of this API operation.

9.2.2 Mn3g APIs

9.2.2.1 N3G_Message_Delivery API

9.2.2.1.1 General

API description: This API enables the MSGin5G Server to deliver MSGin5G message to the Non-3GPP Message Gateway.

9.2.2.1.2 Send_Message operation

API operation name: Create_MSGin5G_Message

Description: Send an MSGin5G message to Non-3GPP Message Gateway.

Known Consumers: M5S.

Inputs: Refer subclause 8.3.3

Outputs: Refer subclause 8.3.3

See subclause 8.3.3 for the details of usage of this API operation.

9.2.2.2 N3G_Delivery_Status_Report API

9.2.2.2.1 General

API description: This API enables the MSGin5G Server to deliver a Delivery Status Report to the Non-3GPP Message Gateway.

9.2.2.2.2 Report_Message_Delivery_Status operation

API operation name: Report_Message_Delivery_Status

Description: Send an MSGin5G message delivery status report to Non-3GPP Message Gateway.

Known Consumers: M5S.

Inputs: Refer subclause 8.3.5

Outputs: Refer subclause 8.3.5

See subclause 8.3.5 for the details of usage of this API operation.

9.2.3 Mbg APIs

9.2.3.1 Nbg_Message_Delivery API

9.2.3.1.1 General

API description: This API enables the MSGin5G Server to deliver MSGin5G messages to the Broadcast Message Gateway.

9.2.3.1.2 Send_Message operation

API operation name: Create_MSGin5G_Message

Description: Send an MSGin5G message to Broadcast Message Gateway.

Known Consumers: M5S.

Inputs: Refer subclause 8.3.3

Outputs: Refer subclause 8.3.3

See subclause 8.3.3 for the details of usage of this API operation.

10 Information Elements

10.1 Payload

The *Payload* Information Element carries the application payload that is transferred by the MSGin5G Service, of which the content is transparent to the MSGin5G Service.

If the message originates from an MSGin5G UE, the *Payload* IE is a string of maximum length that can be transported without segmentation but not more than 2048 octets.

10.2 Application ID

The *Application ID* Information Element identifies the Application Client on the UE or in the Application Server.

The *Application ID* is a string, which shall allow identifying 65535 different Application Clients. The *Application ID* is configured or provisioned in the Application Client or the Application Server.

10.3 Messaging Topic

The *Messaging Topic* Information Element indicates the topic of the message, which an interested UE or Application Server can subscribe to.

The *Messaging Topic* IE is a string, which shall allow identifying 65535 different Messaging Topics. Allocating and populating the *Messaging Topic* IE is done by the Application Client or the Application Server.

10.4 Broadcast Area ID

The *Broadcast Area ID* Information Element identifies the service area where the Broadcast Message will be delivered.

The *Broadcast Area ID* IE is a string, which shall allow identifying 65535 different Broadcast Areas. The *Broadcast Area ID* is provisioned on the Application Client or the Application Server and is mapped by the Broadcast Message Gateway onto the Broadcast Area as used by the broadcast service in the 5GC.

10.5 Message ID

The Message ID Information Element uniquely identifies a specific MSGin5G message in the MSGin5G Service. If message delivery status report is requested by an MSGin5G message, the Message ID IE in this MSGin5G message is used by the sender of the MSGin5G message to match the message delivery status report with the original MSGin5G message. It is also used by the MSGin5G Server in aggregating the message delivery status report message delivery status reports.

The Message ID shall be unique within the MSGin5G Service and shall be generated by the sender of a new message.

10.6 Failure Cause

The Failure Cause Information Element indicates the the failure reason of an MSGin5G message, if this MSGin5G message can not be delivered successfully.

The Failure Cause IE is a string, which shall allow identifying 65535 different failure reasons.

11 Deployment models

11.1 General

This clause describes deployments of the functional model specified in clause 5.

11.2 Deployment of MSGin5G server(s)

The MSGin5G server(s) should be deployed in the PLMN operator domain. The VAL service using MSGin5G service for the message delivery acts as Application Server and interacts with MSGin5G Server via MSGin5G-3 reference point. The MSGin5G server(s) connects with the 3GPP network system in one or more PLMN operator domain. The MSGin5G server(s) may be supporting multiple Application Servers.

Figure 11.2-1 illustrates the deployment of multiple MSGin5G Servers in a single PLMN operator domain. Each MSGin5G Server serves a part of MSGin5G service subscribers (including the subscriber using the MSGin5G UE or Non-MSGin5G UE) in this PLMN operator domain. In this deployment, the MSGin5G Servers shall be connected with each other to provide the MSGin5G service to all MSGin5G service subscribers in the PLMN operator domain. The MSGin5G Servers provide MSGin5G service to the Application Server(s) deployed in the VAL service provider domain. The Application Server may be connected and registered to one MSGin5G Server.

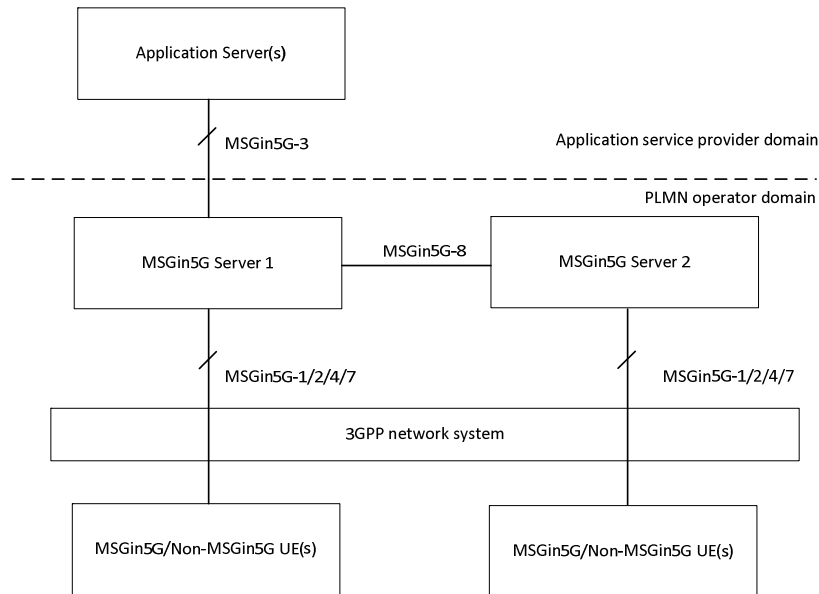


Figure 11.2-1: MSGin5G Server(s) deployed in a single PLMN operator domain with interconnection between MSGin5G Server(s)

Figure 11.2-2 illustrates the deployment of MSGin5G Servers in multiple PLMN operator domains. Each MSGin5G Server serves the MSGin5G service subscribers in this PLMN operator domain. In this deployment, the MSGin5G Servers deployed in PLMN operator domain 1 may be connected with the MSGin5G deployed in PLMN operator domain 2 to provide the MSGin5G service interconnection based on the business agreement between PLMN operator 1 and PLMN operator 2.

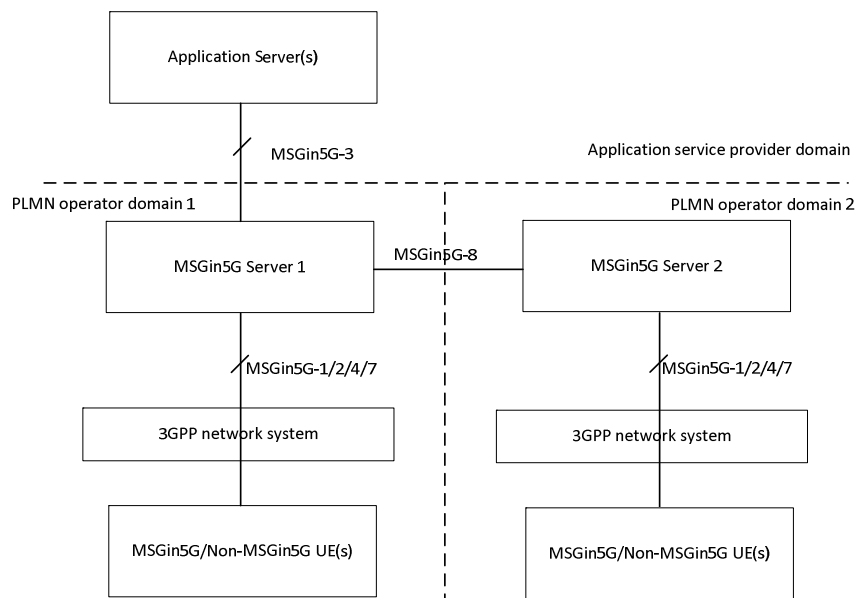


Figure 11.2-2: MSGin5G Server(s) deployed in multiple PLMN operator domain with interconnection between MSGin5G Server(s)

11.3 Deployment of Message Gateway(s)

Figure 11.3-1 illustrates the deployment of Message Gateway in a single PLMN operator domain. If only one Message Gateway, i.e. Message Gateway 1 in Figure 11.3-1, is deployed, all MSGin5G Servers in this PLMN domain may be connected to a single Message Gateway to provide the MSGin5G service for the Non-MSGin5G UEs. Multiple

Message Gateways may also be deployed in a single PLMN operator domain. In this deployment, i.e. Message Gateway 1 and Message Gateway 2 in Figure 11.3-1 are deployed, each Message Gateway is used to provide MSGin5G service for a part of MSGin5G service subscribers in this PLMN operator domain.

NOTE: The relationship between MSGin5G service subscribers served by the MSGin5G Server and Message Gateway, e.g. whether all MSGin5G service subscribers served by MSGin5G Server 1 use Message Gateway 1 or some of them use Message Gateway 1 and some of them use Message Gateway 2, is implementation specific.

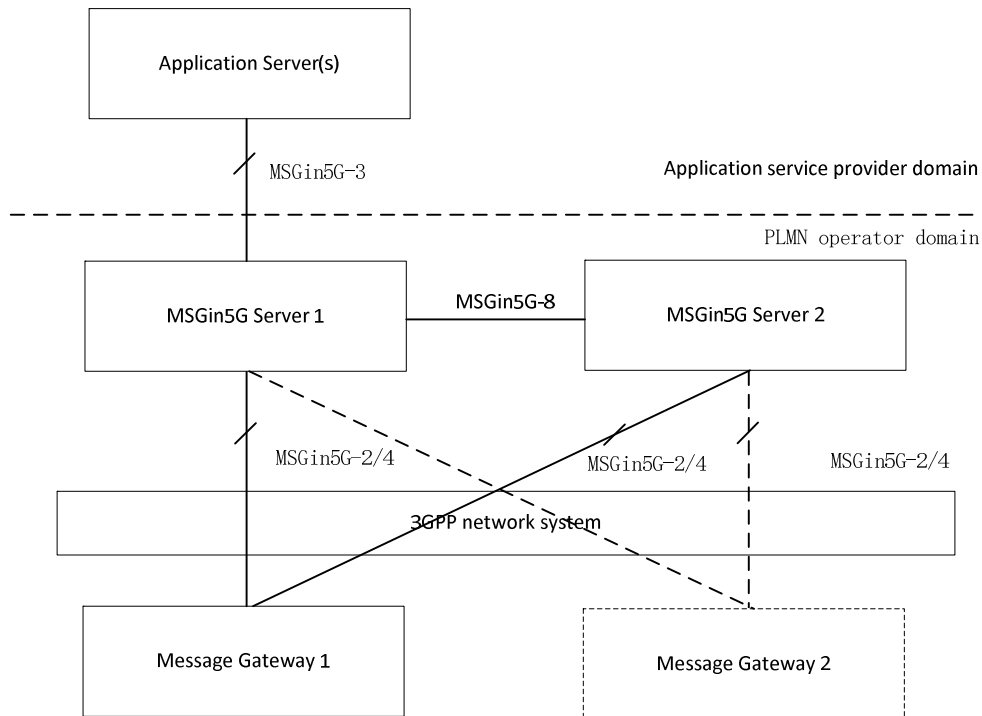


Figure 11.3-1: deployment of Message Gateway in a single PLMN operator domain

Figure 11.3-2 illustrates the deployment of Message Gateway in multiple PLMN operator domains. The MSGin5G Server(s) in one PLMN domain are only connected to the Message Gateway(s) in the same PLMN operator domain to provide the MSGin5G service for the Non-MSGin5G UEs served by this PLMN operator.

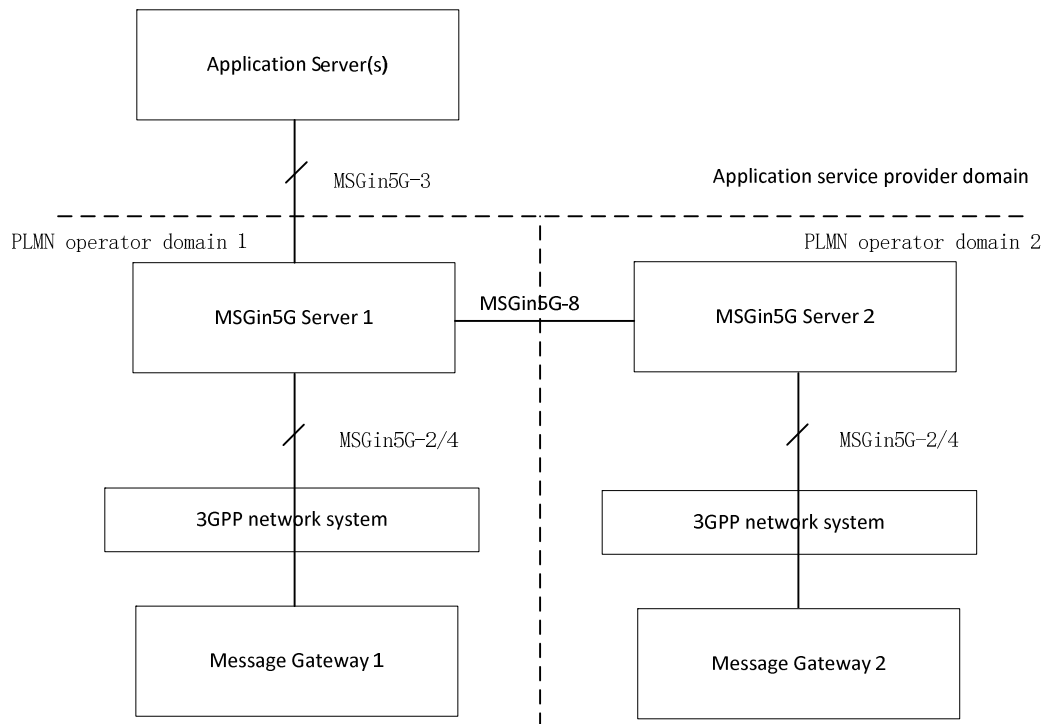


Figure 11.3-2: deployment of Message Gateway in multi PLMN operator domains

11.4 Deployment of MSGin5G Server(s) and SEAL server(s)

If an MSGin5G Server interacts with SEAL Servers over the SEAL-S reference point specified for each SEAL service, i.e. the SEAL Server are not collocated in the MSGin5G Server, the application of functional model to deployments of SEAL servers specified in 3GPP TS 23.434 [5] applied. In the deployment, MSGin5G acts as the VAL servers specified in 3GPP TS 23.434 [5], but may be deployed in the PLMN operator domain.

Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2020-11	SA6#40-e					TR skeleton agreed in SA6#40: S6-202295	0.0.0
2021-01	SA6#41-e					Implemented pCRs approved in SA6#41-e: S6-210363 Editorial changes by the rapporteur	0.1.0
2021-03	SA6#42-e					Implemented pCRs approved in SA6#42-e: S6-210615, S6-210588, S6-210597, S6-210720 Editorial changes by the rapporteur	0.2.0
2021-04	SA6#42 BIS-e					Implemented pCRs approved in SA6#42 BIS-e: S6-210827, S6-211087, S6-211088, S6-210989, S6-211089, S6-211090, S6-211091, S6-211092, S6-211093, S6-211094, S6-211095, S6-210988, S6-210969, S6-211071, S6-211096, S6-210822, S6-211042, S6-211043, S6-211097, S6-211098 Editorial changes by the rapporteur	0.3.0
2021-06	SA6#43 - e					Implemented pCRs approved in SA6#43-e: S6-211135, S6-211136, S6-211367, S6-211337, S6-211232, S6-211338, S6-211230, S6-211342, S6-211339, S6-211340, S6-211341, S6-211399, S6-211400, S6-211349, S6-211490, S6-211169, S6-211343, S6-211344, S6-211430, S6-211355 Editorial changes by the rapporteur	0.4.0
2021-06	SA#92 -e	SP-210474				Presentation for information at SA#92-e	1.0.0
2021-07	SA6#44-e					Implemented pCRs approved in SA6#44-e: S6-211527, S6-211722, S6-211723, S6-211726, S6-211727, S6-211724, S6-211841, S6-211774, S6-211775, S6-211776, S6-211777, S6-211780, S6-211779, S6-211781, S6-211592, S6-211842, S6-211628, S6-211629, S6-211843, S6-211844, S6-211713 Editorial changes by the rapporteur	1.1.0
2021-09	SA6#45-e					Implemented pCRs approved in SA6#45-e: S6-212164, S6-212153, S6-212084, S6-212089, S6-211944, S6-212154, S6-212105, S6-211954, S6-211955, S6-212155, S6-211957, S6-211959, S6-212156, S6-212177 Editorial changes by the rapporteur	1.2.0
2021-09	SA#93-e	SP-210947				Presentation for approval at SA#93-e	2.0.0
2021-09	SA#93-e	SP-210947				MCC Editorial update for publication after TSG SA approval (SA#93)	17.0.0
2021-09						Editorial corrections as agreed by SA6	17.0.1
2021-12	SA#94-e	SP-211521	0001	1	F	Remove ENs with no actions in clause 5	17.1.0
2021-12	SA#94-e	SP-211521	0002	1	F	Corrections in clause 7	17.1.0
2021-12	SA#94-e	SP-211521	0004	2	F	Add definition of MSGin5G Server address	17.1.0
2021-12	SA#94-e	SP-211521	0005	1	F	Correction on clause 5.3.2.2 target resolution	17.1.0
2021-12	SA#94-e	SP-211521	0006	1	F	Correction on message delivery procedure to Message Gateway	17.1.0
2021-12	SA#94-e	SP-211521	0007	1	D	Editorial of MSGin5G	17.1.0
2021-12	SA#94-e	SP-211521	0008	1	F	Remove API Related EN and modify Figure 8.3.5-2	17.1.0
2021-12	SA#94-e	SP-211521	0010	1	F	Correction on clause 8.3.3	17.1.0
2021-12	SA#94-e	SP-211521	0011	1	F	Correction on clause 8.7.5	17.1.0
2021-12	SA#94-e	SP-211521	0012	2	F	5GMARCH store and forward	17.1.0
2021-12	SA#94-e	SP-211521	0014	1	B	Message topic unsubscription	17.1.0
2021-12	SA#94-e	SP-211521	0015	1	F	Editorial correction	17.1.0
2021-12	SA#94-e	SP-211521	0016		F	Corrections on broadcast	17.1.0
2021-12	SA#94-e	SP-211521	0017		F	Alignment on Message Gateway IE name	17.1.0
2021-12	SA#94-e	SP-211521	0018	1	F	Remove one IE from AS originating message send request	17.1.0
2021-12	SA#94-e	SP-211521	0019	1	F	Correction on Message Aggregation	17.1.0
2021-12	SA#94-e	SP-211521	0020	1	F	Security aspect of MSGin5G align with SA3	17.1.0
2022-03	SA#95-e	SP-220105	0021	2	F	Correction on Message Segment Recovery	17.2.0
2022-03	SA#95-e	SP-220105	0022	2	F	Correction on Point-to-Point Message Segmentation and Reassembly	17.2.0
2022-03	SA#95-e	SP-220105	0023	1	F	Correction on Usage of Network Capabilities	17.2.0
2022-03	SA#95-e	SP-220105	0024	1	F	Editorial corrections	17.2.0
2022-03	SA#95-e	SP-220105	0026	2	F	Clarification on clause 5.3.3 functional entity of MSGin5G Client	17.2.0
2022-03	SA#95-e	SP-220105	0027	2	F	Clarification and correction on clause 8.8 Other MSGin5G messaging related procedures	17.2.0
2022-03	SA#95-e	SP-220105	0028	2	F	Clarification and correction on clause 8.11 Constrained devices	17.2.0
2022-03	SA#95-e	SP-220105	0029	1	F	Definitions of Gateway UE and Relay UE	17.2.0
2022-06	SA#96	SP-220481	0030	1	B	Application architecture enhancement of broadcast aspect	18.0.0
2022-06	SA#96	SP-220481	0031	1	B	Broadcast Message delivery procedure	18.0.0
2022-06	SA#96	SP-220481	0032	1	B	Charging architectural requirements	18.0.0
2022-06	SA#96	SP-220481	0033	1	F	Delete the example of the originator address in Table 8.11.5-1	18.0.0
2022-06	SA#96	SP-220481	0034	1	D	Editorial corrections	18.0.0
2022-06	SA#96	SP-220481	0035	2	B	Bulk registration for constrained device over MSGin5G-6 reference point	18.0.0
2022-06	SA#96	SP-220481	0036	1	C	Values and usage of Priority type	18.0.0
2022-06	SA#96	SP-220481	0037	1	C	MSGin5G message aggregation and segment	18.0.0
2022-06	SA#96	SP-220481	0038	1	B	Update of MSGin5G group management	18.0.0

2022-06	SA#96	SP-220481	0039	1	D	Update of abbreviations	18.0.0
2022-06	SA#96	SP-220481	0040	1	F	Clarify relationship between store forward and device triggering	18.0.0
2022-06	SA#96	SP-220481	0041	1	F	Remove the EN of broadcast in clause 10.4	18.0.0
2022-06	SA#96	SP-220481	0042		D	Removal of ENs with no action	18.0.0
2022-06	SA#96	SP-220481	0043	1	B	Messaging Topic handling between different MSGin5G Servers	18.0.0
2022-06	SA#96	SP-220481	0044	1	B	Message delivery based on Messaging Topic for different PLMNs	18.0.0
2022-06	SA#96	SP-220481	0045	1	D	Update of MSGin5G UE registration	18.0.0
2022-09	SA#97	SP-220921	0046	4	F	Update of Non-MSGin5G UE registration	18.1.0
2022-09	SA#97	SP-220921	0047	2	B	Relay selection procedure over MSGin5G-6 interface	18.1.0
2022-09	SA#97	SP-220921	0048	2	F	Correction on clause 8.1.3	18.1.0
2022-09	SA#97	SP-220921	0049		F	Removal of EN in clause 10	18.1.0
2022-09	SA#97	SP-220921	0050		F	Removal of EN in clause 5.3.2.1	18.1.0
2022-09	SA#97	SP-220921	0051	1	F	Aggregated message handling at the MSGin5G Server	18.1.0
2022-09	SA#97	SP-220921	0052	1	F	Typos, readability, and abbreviations	18.1.0
2022-09	SA#97	SP-220921	0053	1	C	Broadcast Message Gateway additions	18.1.0
2022-09	SA#97	SP-220921	0054		C	Handling of Priority Type IE	18.1.0
2022-09	SA#97	SP-220921	0055	1	F	Corrections to clauses 4-6	18.1.0
2022-09	SA#97	SP-220921	0056	3	F	Correction to clause 8.1.3	18.1.0
2022-09	SA#97	SP-220921	0057	3	F	Correction to clause 8.2.1	18.1.0
2022-09	SA#97	SP-220921	0058	1	F	Corrections to clauses 8.2.7- 8.7.3.3	18.1.0
2022-09	SA#97	SP-220921	0059	1	F	Corrections to clauses 8.7.4.2 - 8.7.5.3	18.1.0
2022-09	SA#97	SP-220921	0060	1	F	Corrections for handling topic subscriptions between servers	18.1.0
2022-09	SA#97	SP-220921	0061	1	F	Corrections for constrained devices using gateway UE	18.1.0
2022-09	SA#97	SP-220921	0062	1	F	Corrected figure in chapter 8.7.1.5	18.1.0
2022-09	SA#97	SP-220921	0063	1	F	Security credentials IE in MSGin5G UE registration aligned with 33501	18.1.0
2022-09	SA#97	SP-220921	0064	1	F	Security credentials IE in Message Gateway registration aligned with 33501	18.1.0
2022-09	SA#97	SP-220921	0065	1	F	Security credentials IE in Application Server Registration aligned with 33501	18.1.0
2022-09	SA#97	SP-220921	0066		F	Security credentials IE in messaging procedures aligned with 33501	18.1.0
2022-09	SA#97	SP-220921	0067		F	Security credentials IE in APIs provided by MSGin5G Server aligned with 33501	18.1.0
2022-12	SA#98	SP-221240	0068		F	Remove the EN about Application ID in clause 8.4.2	18.2.0
2022-12	SA#98	SP-221240	0070	1	B	Bulk registration of Non-MSGin5G UEs	18.2.0
2022-12	SA#98	SP-221240	0071	1	B	Bulk de-registration of Non-MSGin5G UEs	18.2.0
2022-12	SA#98	SP-221240	0072	1	B	MSGin5G UE bulk de-registration over MSGin5G-6 reference point	18.2.0
2022-12	SA#98	SP-221240	0073	1	F	Message Aggregation used in Group messaging and Message delivery based on Messaging Topic	18.2.0
2022-12	SA#98	SP-221240	0075		F	Remove EN in clause 8.3.1	18.2.0
2022-12	SA#98	SP-221240	0076		D	Terms alignment	18.2.0
2022-12	SA#98	SP-221240	0078		F	Correction to clause 5.1	18.2.0
2022-12	SA#98	SP-221240	0079	1	F	Correction to clause 6.1.4	18.2.0
2022-12	SA#98	SP-221240	0081	2	F	Corrections to clause 9.1.1.4	18.2.0
2022-12	SA#98	SP-221240	0082	1	F	Corrections to clause 10	18.2.0
2022-12	SA#98	SP-221240	0083	1	F	Note on status reporting of broadcast message	18.2.0
2022-12	SA#98	SP-221240	0086	3	F	Resolution on EN about UE type	18.2.0
2022-12	SA#98	SP-221240	0087		F	Resolution on Editor's Note on Priority IE for constrained devices	18.2.0
2022-12	SA#98	SP-221240	0088	1	F	Correction to clause 8.4.2	18.2.0
2022-12	SA#98	SP-221240	0090		F	Rewording some steps in clause 8.4.2	18.2.0
2022-12	SA#98	SP-221240	0092	2	B	MSGin5G UE bulk configuration over MSGin5G-6 reference point	18.2.0
2022-12	SA#98	SP-221240	0094		F	Remove EN in clause 8.9.2	18.2.0
2023-03	SA#99	SP-230285	0095	2	D	Corrections for clause 4.3.2	18.3.0
2023-03	SA#99	SP-230285	0096	2	D	Editorial type corrections for clause 5.2	18.3.0
2023-03	SA#99	SP-230285	0097	1	C	Add the element of Registration expiration time	18.3.0
2023-03	SA#99	SP-230285	0098	1	F	Update the scope	18.3.0
2023-03	SA#99	SP-230285	0100	1	F	The MSGin5G Client Profile handling on MSGin5G Server	18.3.0
2023-03	SA#99	SP-230285	0101	1	B	Adds new group management capabilities to MSGin5G service	18.3.0
2023-03	SA#99	SP-230285	0102	1	C	Separation of Availability and Reachability concepts	18.3.0
2023-03	SA#99	SP-230285	0104	1	F	AS registration is optional	18.3.0
2023-03	SA#99	SP-230285	0105	2	F	Various corrections on Topic handling	18.3.0
2023-03	SA#99	SP-230285	0106	1	C	Device Triggering should not be restricted to the AS	18.3.0
2023-03	SA#99	SP-230285	0107	1	F	Clarification when Store and forward applies	18.3.0
2023-03	SA#99	SP-230285	0108	1	D	Missing abbreviation	18.3.0
2023-03	SA#99	SP-230285	0109	1	F	Correction to UE-1 in Application Architecture	18.3.0
2023-03	SA#99	SP-230285	0110	1	F	Corrections on clause 8.11	18.3.0
2023-03	SA#99	SP-230285	0114	1	F	Architecture and reference point between MSGin5G Servers	18.3.0
2023-03	SA#99	SP-230285	0115	1	F	Deployment models	18.3.0
2023-03	SA#99	SP-230285	0117	1	B	Messaging Topic Event API	18.3.0
2023-04						Editorial corrections; corrupt style of Figure 5.2-2 title and replacing in the requirement [AR-4.1.2-e] description "Including" with "including"	18.3.1

2023-06	SA#100	SP-230697	0119	1	F	MSGin5G-8 naming issue	18.4.0
2023-06	SA#100	SP-230697	0121	1	F	Modification of security credentials IE	18.4.0
2023-06	SA#100	SP-230697	0123	3	F	Update the architecture for constrained device	18.4.0
2023-06	SA#100	SP-230697	0124	2	F	Update the constrained device related definitions	18.4.0
2023-06	SA#100	SP-230697	0125	1	F	Update the Messaging Topic handling between different MSGin5G Servers	18.4.0
2023-06	SA#100	SP-230697	0126		F	Resolution of EN in 8.4.2	18.4.0
2023-06	SA#100	SP-230697	0127	2	C	Resolution of ENs in 8.5.x	18.4.0
2023-06	SA#100	SP-230697	0128	1	C	Some correction on identities	18.4.0
2023-06	SA#100	SP-230697	0129		F	Update of 8.2.7 MSGin5G UE bulk registration based on constrained UE related architecture	18.4.0
2023-06	SA#100	SP-230697	0130	2	F	Update of clause 8.2.8	18.4.0
2023-06	SA#100	SP-230697	0131	1	F	Update of clause 8.2.9 and 8.2.10 for Non-MSGin5G UE bulk (de)registration	18.4.0
2023-06	SA#100	SP-230697	0132	1	F	Update of clause 8.2.11 MSGin5G UE bulk de-registration	18.4.0
2023-06	SA#100	SP-230697	0133	1	F	Update of clause 8.11.1	18.4.0
2023-06	SA#100	SP-230697	0134	2	F	Update of Application Client (de-)registration using MSGin5G Client	18.4.0
2023-06	SA#100	SP-230697	0135	1	F	Update of Application Client sending and receiving message using MSGin5G Client	18.4.0
2023-06	SA#100	SP-230697	0136	1	F	Clarify procedures in clause 8.3 with corrections	18.4.0
2023-06	SA#100	SP-230697	0138	1	F	New Message Delivery Flow	18.4.0
2023-07	SA#100					Editorial corrections to the CR implementations like e.g. correcting the incorrect red text in the bullet in clause 5.3.3.2	18.4.1
2023-09	SA#101	SP-230995	0139	1	F	Correction of grammatical errors	18.5.0
2023-09	SA#101	SP-230995	0140	1	F	Correction on NOTE 8 in clause 5.2	18.5.0
2023-09	SA#101	SP-230995	0141	1	F	Message delivery flow	18.5.0
2023-09	SA#101	SP-230995	0143	4	F	Corrections to clause 8.1.4	18.5.0
2023-09	SA#101	SP-230995	0144	2	F	Corrections to MSGin5G Registration	18.5.0
2023-09	SA#101	SP-230995	0145	1	F	Correction to MSGin5G UE De-registration	18.5.0
2023-09	SA#101	SP-230995	0146	1	F	Corrections to Non-MSGin5G UE Registration	18.5.0
2023-09	SA#101	SP-230995	0147	2	F	Corrections to AS (de-)registration	18.5.0
2023-09	SA#101	SP-230995	0148	3	F	Corrections to MSGin5G UE bulk (de-)registration	18.5.0
2023-09	SA#101	SP-230995	0149	2	F	Corrections to Constrained UE registration procedure	18.5.0
2023-09	SA#101	SP-230995	0150	1	F	Correction of profile storing	18.5.0
2023-09	SA#101	SP-230995	0151	1	F	No response message if message is discarded	18.5.0
2023-09	SA#101	SP-230995	0153	1	F	Corrections on message segmentation	18.5.0
2023-09	SA#101	SP-230995	0155	1	F	Corrections to Topic Unsubscription	18.5.0
2023-09	SA#101	SP-230995	0156	2	F	Correction for subscription management between 2 servers	18.5.0
2023-09	SA#101	SP-230995	0157		F	Corrections in pre-conditions	18.5.0
2023-09	SA#101	SP-230995	0159	1	F	Correction to procedure for inter-PLMN message exchange	18.5.0
2023-09	SA#101	SP-230995	0160	3	F	Correction of reference	18.5.0
2023-09	SA#101	SP-230995	0161	1	F	Correction to empty clause 8.10.3.2	18.5.0
2023-09	SA#101	SP-230995	0162	1	F	Legacy and non 3GPP Message Gateway interactions with SEAL services	18.5.0
2023-09	SA#101	SP-230995	0163		F	Correction to clause 4.2.2	18.5.0
2023-09	SA#101	SP-230995	0167	1	F	Correction on Message Aggregation at MSGin5G Client	18.5.0
2023-09	SA#101	SP-230995	0168	3	F	Update of the Message Aggregation at MSGin5G Server	18.5.0
2023-12	SA#102	SP-231542	0170		F	Messaging Topic list unsubscription	18.6.0
2023-12	SA#102	SP-231542	0171		F	Messaging Topic related unsubscription APIs	18.6.0
2023-12	SA#102	SP-231542	0173	2	F	UE reachability status monitoring is decided by application layer	18.6.0
2023-12	SA#102	SP-231542	0176	1	F	Resolution of EN	18.6.0
2023-12	SA#102	SP-231542	0177	1	F	Resolution of EN	18.6.0
2023-12	SA#102	SP-231542	0178		F	Resolution of EN	18.6.0
2023-12	SA#102	SP-231542	0179		F	Resolution of EN	18.6.0
2023-12	SA#102	SP-231542	0182		F	Resolution of EN	18.6.0
2023-12	SA#102	SP-231542	0183		F	Resolution of EN	18.6.0
2023-12	SA#102	SP-231542	0186	1	F	Removal of Topic	18.6.0
2023-12	SA#102	SP-231542	0187	1	F	Response message for segmented message is wrong	18.6.0
2023-12	SA#102	SP-231542	0189	1	F	Add general description in clause 8.2	18.6.0
2023-12	SA#102	SP-231542	0190	2	F	Add general description in clause 8.8	18.6.0
2023-12	SA#102	SP-231542	0191	1	F	Pre-conditions in clause 8.2.8	18.6.0
2024-03	SA#103	SP-240299	0198	1	F	Correction on Message response	18.7.0
2024-03	SA#103	SP-240299	0200		F	Correction on Supported MSGin5G segment size and the procedure of segmentation	18.7.0
2024-06	SA#104	SP-240753	0208	1	F	Update the elements of application Server de-registration response	18.8.0
2024-06	SA#104	SP-240753	0209		F	Update the elements of application Server de-registration response	18.8.0
2025-06	SA#108	SP-250591	0223		F	Remove EN in clause 8.1.4	18.9.0
2025-06	SA#108	SP-250591	0224		F	Remove EN in clause 8.7	18.9.0
2025-06	SA#108	SP-250591	0226		F	Remove EN in clause 8.8.4.1	18.9.0
2025-06	SA#108	SP-250591	0228	1	F	Remove EN in clause 8.11.2	18.9.0
2025-06	SA#108	SP-250591	0231	1	F	Remove ENs regarding security aspects of bulk registration	18.9.0
2025-06	SA#108	SP-250591	0232	1	F	Remove MSGin5G-5 APIs related ENs	18.9.0

2025-09	SA#109	SP-251048	0233		F	Remove EN in 5.2	18.10.0
2025-09	SA#109	SP-251048	0234		F	Remove EN in 8.7.4.2	18.10.0
2025-09	SA#109	SP-251048	0235		F	Remove EN in 8.11.1 and 8.11.4	18.10.0
2025-09	SA#109	SP-251048	0236		F	Remove EN in clause 8.7.5.2 and 8.8.4.2	18.10.0
2025-09	SA#109	SP-251048	0237		F	Remove EN in clause 11.2	18.10.0

History

Document history		
V18.7.0	April 2024	Publication
V18.8.0	July 2024	Publication
V18.9.0	July 2025	Publication
V18.10.0	September 2025	Publication