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| 3GPP TR 33.862 V0.2.0 (2020-11) | |
| Technical Report | |
| 3rd Generation Partnership Project;  Technical Specification Group Services and System Aspects;  Study on security aspects of the Message Service for MIoT over the 5G System (MSGin5G) | |
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| ***3GPP***  Postal address  3GPP support office address  650 Route des Lucioles - Sophia Antipolis  Valbonne - FRANCE  Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16  Internet  http://www.3gpp.org |
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Contents

Foreword 4

1 Scope 6

2 References 6

3 Definitions of terms, symbols and abbreviations 6

3.1 Terms 6

3.2 Symbols 6

3.3 Abbreviations 7

4 Overview of MSGin5G Service 7

5 Key issues 7

5.1 Key issue #1: Transport security for the MSGin5G interfaces 7

5.1.1 Key issue details 7

5.1.2 Threats 8

5.1.3 Potential security requirements 8

5.2 Key issue #2: Authentication and Authorization between 5GMSGS client and MSGin5G Server 8

5.2.1 Key Issue Details 8

5.2.2 Security Threats 9

5.2.3 Potential Security Requirements 9

5.3 Key issue #3: Authentication and Authorization between Application server and MSGin5G Server 9

5.3.1 Key Issue Details 9

5.3.2 Security Threats 9

5.3.3 Potential Security Requirements 9

5.X Key issue #X: <Key issue name> 10

5. X.1 Key issue details 10

5. X.2 Threats 10

5. X.3 Potential security requirements 10

6 Proposed solutions 10

6.0 Mapping of Solutions to Key Issues 10

6.1 Solution #1: <Solution name> 10

6.1.1 Introduction 10

6.1.2 Solution details 10

6.1.3 Evaluation 10

6.X Solution #X: <Solution name> 11

6.X.1 Introduction 11

6.X.2 Solution details 11

6.X.3 Evaluation 11

7 Conclusions 11

Annex <X> (informative): Change history 12

# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

**shall** indicates a mandatory requirement to do something

**shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

**should** indicates a recommendation to do something

**should not** indicates a recommendation not to do something

**may** indicates permission to do something

**need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

**can** indicates that something is possible

**cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

**will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

**might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

# 1 Scope

The present document studies the security aspects on the support of the 5GMSG Service defined in TR 23.700-24 [2], determines key issues of potential security requirements and proposed possible security solutions to meet these security requirements.

# 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 TR 23.700-24: " Study on support of the 5GMSG Service ".

[3] 3GPP TS 23.222: " Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs; Stage 2".

[4] 3GPP TS 33.434: "Service Enabler Architecture Layer (SEAL); Security aspects for Verticals".

[5] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[6] 3GPP TS 33.210: "Network Domain Security (NDS); IP network layer security".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms 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].

**example:** text used to clarify abstract rules by applying them literally.

Editor’s Note: Example needs to be deleted

## 3.2 Symbols

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

<symbol> <Explanation>

Editor’s Note: Example needs to be deleted

## 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].

<ABBREVIATION> <Expansion>

Editor’s Note: Example needs to be deleted

# 4 Overview of MSGin5G Service

Editor’s Note: This clause will contain a brief overview on MSGin5G Service

# 5 Key issues

Editor’s Note: This clause will contain the agreed key issues

## 5.1 Key issue #1: Transport security for the MSGin5G interfaces

### 5.1.1 Key issue details

TR 23.700-24 [2], clause 8.2 describes an application architecture of the MSGin5G Service.

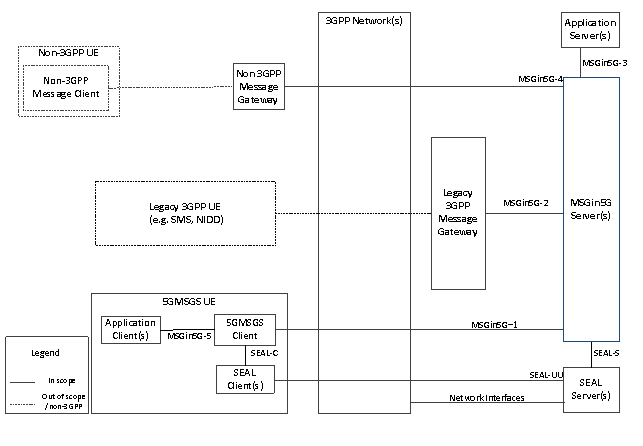


Figure 5.1.1-1: Application Architecture of the MSGin5G Service

New interfaces (i.e. MSGin5G-1-5) were introduced in the architecture for MSGin5G Service. This key issue studies the related transport security, i.e. confidentiality, integrity and replay-protection.

**MSGin5G-1:** Between a 5GMSGS client and a MSGin5G Server. This reference point supports:

- Registration of a 5GMSGS client to a MSGin5G Server when not using IMS base solution; and the exchange of MSGin5G messages.

**MSGin5G-2:** Between a MSGin5G Server and the Legacy 3GPP Message. This reference point supports:

- Indicating the underlying message delivery mechanism to the Legacy 3GPP Message Gateway; and exchange of MSGin5G messages; and registration of Legacy 3GPP Message Gateway to MSGin5G Server.

**MSGin5G-3:** Between an Application Server and a MSGin5G Server. 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[3].

**MSGin5G-4:** Between a Non-3GPP Message Gateway and a MSGin5G server. This reference point supports:

- Registration of Non-3GPP Message Gateway to MSGin5G Server; and the exchange of MSGin5G messages.

**MSGin5G-5:** Between an application client and a 5GMSGS client. This reference point supports:

- Providing information from application clients required to enable the 5GMSGS client to construct a MSGin5G message to be delivered to other MSGin5G service endpoints.

- Configuring application clients with information required to enable the 5GMSGS 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 5GMSGS client to the application clients from other MSGin5G service endpoints.

NOTE: As MSGin5G-5 is an internal interface between application client and a 5GMSGS client within the UE, the protection is taken care by the UE implementation.

### 5.1.2 Threats

Without confidentiality, integrity and replay protection, an attacker may eavesdrop or manipulate or replay the communication or initiate the MitM attacks on the interface.

### 5.1.3 Potential security requirements

Confidentiality protection, integrity protection and replay-protection shall be supported on the MSGin5G-1-4 interfaces.

## 5.2 Key issue #2: Authentication and Authorization between 5GMSGS client and MSGin5G Server

### 5.2.1 Key Issue Details

As per 23.700-24 [2], MSGin5G-1 between a 5GMSGS client and a MSGin5G Server. This reference point supports registration and de-registration of a 5GMSGS client to a MSGin5G Server when not using IMS based solution and the exchange of MSGin5G messages.

During registration, the 5GMSGS Client provides profile/availability information for the 5GMSGS Client and the Application Clients that are serviced by the 5GMSGS Client to the MSGin5G Server. The profile/availability information includes contact information such as UE Identifier(s) and port number(s) which the 5GMSGS Client and the Application Clients listen on for incoming MSGin5G messages, supported MSGin5G capabilities (e.g. MOMT, AOMT, MOAT, Group, Broadcast) and MSGin5G service requirements (e.g. required time windows of service, message latency and data rates).

### 5.2.2 Security Threats

When registration and de-registration is used without authorization, if the registration is a new registration, the MSGin5G Server assigns a unique 5GMSGS Client ID to the malicious 5GMSGS client receive. The malicious 5GMSGS Client stores the identifier and uses it in all future MSGin5G communication with the MSGin5G Server. The Malicious 5GMSGS client may receive information e.g. URI, Application Server Functionalities, protocols which may reveal the security domain topology of the server. Malicious 5GMSGS Client may use this information to launch attacks on MSGin5G server.

### 5.2.3 Potential Security Requirements

MSGin5G Server and 5GMSGS Client shall be mutually authenticated over MSGin5G-1 Interface.

The 5GMSGS client shall be authorized to access MSGin5G services.

## 5.3 Key issue #3: Authentication and Authorization between Application server and MSGin5G Server

### 5.3.1 Key Issue Details

As per 23.700-24 [2], MSGin5G-3 between an Application Server and a MSGin5G Server. This reference point supports access to MSGin5G Server and APIs to enable sending and receiving of MSGin5G messages.

During registration, the MSGin5G server should be able to verify the Application server, otherwise MSGin5G server may share sensitive information to the application server such as 5GMSGS Client ID, APIs like so.

### 5.3.2 Security Threats

During registration, the MSGin5G server should be able to verify the Application server, otherwise MSGin5G server may share sensitive information to the application server such as 5GMSGS Client ID, APIs like so. These informations can be used by the application server to mount an attack to get services from MSGin5G server without the server knowing its liability.

### 5.3.3 Potential Security Requirements

The system shall support mutual authentication and authorization between application server and MSGin5G server over MSGin5G-3 Interface.

Editor’s Note: This below provides a generic set of headings for a new key issue and need to be deleted before the TR goes for approval

## 5.4 Key issue #4: Authentication and Authorization between MSGin5G Gateway Client and MSGin5G Server

### 5.X.1 Key Issue Details

As per 23.700-24 [2], MSGin5G-4 is between a MSGin5G Gateway Client and a MSGin5G Server. This reference point supports registration of MSGin5G Gateway Client to MSGin5G Server and the exchange of MSGin5G messages.

During registration, the MSGin5G server should be able to verify the MSGin5G Gateway Client, otherwise malicious Gateway Client may connect to MSGin5G server, so that sensitive information such as 5GMSGS Client ID may leak out.

### 5.4.2 Security Threats

During registration, if the MSGin5G server transfers information without verify the MSGin5G Gateway Client, malicious Gateway Client may connect to MSGin5G server, so that sensitive information such as 5GMSGS Client ID may leak out. Malicious Gateway Client may use this information to launch attacks on MSGin5G server.

These informations can be used by malicious Gateway Client to mount an attack to get services from MSGin5G server without authorization.

### 5.4.3 Potential Security Requirements

MSGin5G Server shall be able to provide mutual authentication with MSGin5G Gateway Client over MSGin5G-4 Interface.

MSGin5G Server shall be able to determine whether MSGin5G Gateway Client is authorized to access MSGin5G services.

# 6 Proposed solutions

Editor’s Note: This clause will contain the proposed solutions

## 6.0 Mapping of Solutions to Key Issues

Table 6.0-1: Mapping of Solutions to Key Issues

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Solutions | Key Issues | | | |
| 1 | X |  |  |
| #1: <Solution name> | X |  |  |  |
| #X: <Solution name> | X |  |  |  |

Editor’s Note: This clause provides the mapping of Solutions to Key Issues.

## 6.1 Solution #1: Authentication and authorization between 5GMSGS client and MSGin5G server

### 6.1.1 Solution overview

This solution addresses the security requirement for the Authentication and Authorization between 5GMSGS client and MSGin5G server in key issue #2.

This solution uses SEAL server as an access token issuer and validator. SEAL Client authenticates with SEAL server as a result of which it receives access token using OpenID Connect protocol as specified in TS 33.434 [4].

Access token is used for authorization of the 5GMSGS UE Client to access/obtain the MSGin5G services.

### 6.1.2 Solution details



**Figure 6.X.2-1: Authentication/Authorization framework for 5GMSGS client and MSGin5G servers**

Step 1: SIM-C establishes a secure tunnel with the SIM-S.

Step 2: SIM-C sends an OpenID Connect Authentication Request to the SIM-S. The request contains an indication of authentication methods supported by the UE.

Step 3: User Authentication is performed between SIM-C and the SIM-S. On receiving OpenID Connect Authentication Request, SIM-S provides HTML page to the SIM-C.

Step 4: SIM-C authenticates itself by giving username and password.

Editor’s Note: Other possible authentication methods are FFS.

Step 5: SIM-S verifies the username and password and authenticates the UE.

Step 6: SIM-S sends an OpenID Connect Authentication Response to SIM-C containing an authorization code (AuthCode).

Step 7: SIM-C sends an OpenID Connect Token Request to the SIM-S, passing the AuthCode.

Step 8: SIM-S sends an OpenID Connect Token Response to the UE containing an ID\_token and an access token (each which uniquely identify the user of the MSGin5G service). The access token is used by the 5GMSGS UE client to communicate and authorize the identity of the 5GMSGS UE client to the MSGin5G server.

Step 9: 5GMSGS UE client gets the ID\_Token and access token from the SIM-C.

Step 10: A secure IPSec tunnel is established between 5GMSGS UE client and MSGin5G server.

Step 11: The 5GMSGS UE client initiates application registration procedure with the MSGin5G server, including the access token obtained from SIM-S at step 6 required for the 5GMSGS Client to register to the MSGin5G Server.

The request also includes a 5GMSGS Client Profile for the 5GMSGS Client initiating the registration request. The 5GMSGS client profile includes UE ID, 5GMSGS Client ports, 5GMSGS Client ID, 5GMSGS Client capabilities.

Step 12: The authorization check for the application registration request is performed by verification of the access token issued by the SIM-S. The MSGin5G server obtains the access token validation service from the SIM-S.

Step 13: MSGin5G server sends the application accept or reject response based on the result of access token validation.

Editor’s Note: Whether OpenID will be supported is FFS.

Editor’s Note: How SIM-S associate SIM-C with 5GMSGS client is FFS.

Editor’s Note: What is inside the Access Token and its format is FFS.

### 6.1.3 Solution evaluation

TBD

## 6.2 Solution #2: Authentication and authorization between 5GMSGS UE client and MSGin5G server using secondary authentication

### 6.2.1 Solution overview

This solution addresses the security requirement for the Authentication and Authorization between 5GMSGS UE client and MSGin5G server in key issue #2.

This solution proposes to reuse the secondary authentication procedure for the authentication between the 5GMSGS Client and the MSGin5G server as specified in TS 33.501 [5].

### 6.2.2 Solution details



**Figure 6.X.2-1: Authentication/Authorization framework for 5GMSGS UE client and MSGin5G servers using secondary authentication**

1. The UE registers to the network and perform the primary authentication procedure.

2. When the UE triggers the MSGin5G service it sends the PDU session establishment request to the AMF to setup the PDU session for the MSGF.

3-6. The following steps 3, 4, 5, 6 are the same as in clause 11.1.2 of TS 33.501[5]. The secondary authentication procedure is performed. The SMF should trigger EAP Authentication procedure and perform the role of the EAP Authenticator. The MSGF is the EAP server (AAA) of the DN.

7-8. After the successful completion of the secondary authentication procedure, the MSGF sends EAP Success message to the SMF including the registration response.

9. The SMF sends a Namf\_Communication\_N1N2MessageTransfer to the AMF with the EAP success message.

10. The AMF forwards PDU Session Establishment Response message along with EAP Success.

### 6.2.3 Solution evaluation

TBD

## 6.3 Solution #3: Transport security protection for MSGin5G-1 interfaces

### 6.3.1 Solution overview

This solution addressed the transport security requirements for MSGin5G-1 interface defined in key issue#1. As specified in SEAL specification TS 33.434[4], NDS/IP should be used for the data protection over MSGin5G-1 interface.

### 6.3.2 Solution details

The protection of this interface should be supported according to NDS/IP as specified in TS 33.210 [6] as per VAL-UU protection defined in TS 33.434[4].

NOTE: NSD/IP is used only when SEAL enabler is supported by the UE.

### 6.3.3 Solution evaluation

TBD

Editor’s Note: This below provides a generic set of headings for a new solution and need to be deleted before the TR goes for approval

# 7 Conclusions

Editor’s Note: This clause will contain the conclusion of the TR

Annex <X> (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2020/10/19 | 3GPP SA3 100bis-e | S3-202765 |  |  |  | S3-202304,S3-202533,S3-201615,S3-202616,S3-202617 | 0.1.0 |
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