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TECHNICAL SPECIFICATION

Universal Mobile Telecommunications System (UMTS);
LTE;
Tsp interface protocol between
the MTC Interworking Function (MTC-IWF)
and Service Capability Server (SCS)
(3GPP TS 29.368 version 14.4.0 Release 14)

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1 Scope

The present document provides the stage 3 specification of the Tsp reference point for the present release. The functional requirements and the stage 2 specifications of the Tsp reference point are contained in TS 23.682 [2]. The Tsp reference point lies between the Service Capability Server (SCS) and the Machine Type Communication Inter Working Function (MTC-IWF).

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 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[3] 3GPP TS 29.329: "Sh Interface based on the Diameter protocol".

[4] IETF RFC 791: "Transmission Control Protocol".

[5] IETF RFC 2234: "Augmented BNF for syntax specifications".

[6] IETF RFC 3588: "Diameter Base Protocol".

[7] IETF RFC 4006: "Diameter Credit Control Application".

[8] IETF RFC 4960: "Stream Control Transmission Protocol".

[9] IETF RFC 5719: "Updated IANA Considerations for Diameter Command Code Allocations".

[10] 3GPP TS 33.210: "Network Domain Security (NDS); IP network layer security".

[11] 3GPP TS 33.310: "Network Domain Security (NDS); Authentication Framework (AF)".

[12] 3GPP TS 29.336: "Home Subscriber Server (HSS) diameter interfaces for interworking with packet data networks and applications".

[13] 3GPP TS 29.303: "Domain Name System Procedures; Stage 3".

[14] 3GPP TS 23.003: "Numbering, addressing and identification".

[15] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS)".

[16] 3GPP TS 29.229: "Cx and Dx interfaces based on the Diameter protocol".

[17] 3GPP TS 29.337: "Diameter-based T4 interface for communications with packet data networks and applications".

[18] IETF RFC 6733: "Diameter Base Protocol".

[19] IETF RFC 8583:"Diameter Load Information Conveyance".

[20] 3GPP TS 29.338: "Diameter based protocols to support SMS capable MMEs".

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 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 TR 21.905 [1].

3.2 Symbols

For the purposes of the present document, no symbols are defined.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

AVP	Attribute Value Pair
CEA	Capabilities-Exchange-Answer
CER	Capabilities-Exchange-Request
DAA	Device-Action-Answer
DAR	Device-Action-Request
DNA	Device-Notification-Answer
DNR	Device-Notification-Request
DNS	Domain Name System
ESP	Encapsulating Security Payload
IKE	Internet Key Exchange
IWF	Inter Working Function
MTC	Machine Type Communication
PKI	Public key infrastructure
SCS	Service Capability Server
TLS	Transport Layer Security

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4 Tsp reference point

4.1 Tsp Reference model

The Tsp reference point is defined between the Service Capability Server (SCS) and the Machine Type Communication Inter Working Function (MTC-IWF). The relationships between the different functional entities involved are depicted in figure 4.1.1.

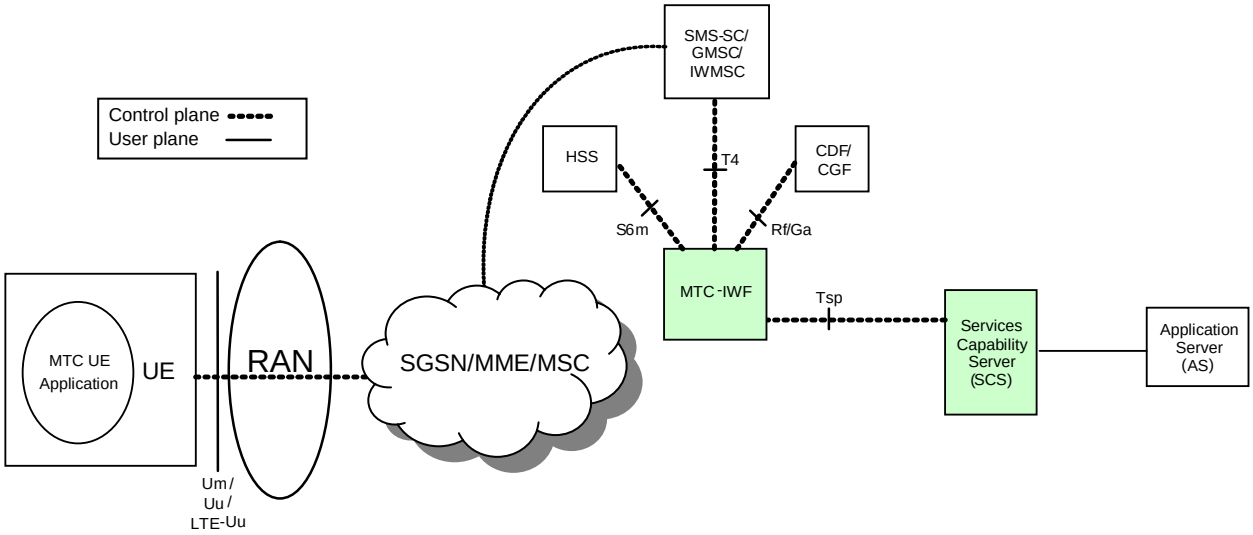

Figure 4.1.1: Tsp reference point at 3GPP Architecture for Machine -Type Communication

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4.2 Functional elements

4.2.1 SCS

The SCS is the entity which connects MTC application servers to the 3GPP network to enable them to communicate through specific 3GPP defined services with UEs used for MTC and with the MTC-IWF in the HPLMN. The SCS offers capabilities for use by one or multiple MTC application servers.

An SCS can be connected to one or more MTC-IWFs.

The SCS is controlled by the operator of the HPLMN or by a MTC Service Provider.

4.2.2 MTC-IWF

The MTC-IWF resides in the HPLMN. An MTC-IWF could be a standalone entity or a functional entity of another network element. The MTC-IWF hides the internal PLMN topology and relays or translates information sent over Tsp to invoke specific functionality in the PLMN.

An MTC-IWF can be connected to one or more SCSs.

The functionality of the MTC-IWF includes the following:

- terminates the Tsp, S6m, T4 and Rf/Ga reference points;
- supports ability to authorize the SCS before communication establishment with the 3GPP network;
- supports ability to authorize control plane requests from an SCS;
- supports the following device trigger functionality:
  - reception of a device trigger request from SCS;
  - reception of a device trigger recall/replace request from SCS;
  - reporting to the SCS the acceptance or non-acceptance of the device trigger request;
  - reporting to the SCS the acceptance or non-acceptance of the device trigger recall/replace request;
- reports to the SCS the success, failure or unconfirmed outcome of a device trigger delivery;

- reports to the SCS the success, failure or unconfirmed outcome of the device trigger recall/replace request;
- provides load control information to SCS as part of the response to trigger requests;
- for MSISDN-less MO-SMS, delivers a payload and application port ID and the external ID of the UE to the SCS;
- supports ability for secure communication between the 3GPP network and the SCS.

The architecture allows the use of multiple MTC-IWFs within a HPLMN.

5 Procedures over Tsp reference point

5.1 General

The following procedures apply over the Tsp reference point:

- Request and confirmation of a device trigger
- Notification of a device trigger
- Recalling or replacing of an already submitted device trigger
- Delivery of a MSISDN-less MO-SMS

5.2 Reference number handling

The reference number shall be assigned by the SCS. The reference number shall be provided by the SCS to the MTC-IWF in the first procedure initiated for a specific target of a specific action request (e.g. for a device trigger request towards a specific MTC device). The MTC-IWF and SCS shall use this reference number for all consecutive related procedures (e.g. for a confirmation of device trigger and notification of device trigger).

The reference number shall be kept in MTC-IWF and in SCS until all related procedures for a specific target of a specific action request initiated by the SCS are completed (e.g. until the notification of device trigger is completed).

For each new specific action request other than Device Trigger Recall Request, the SCS shall assign a reference number, which is different from any other reference number it has previously assigned to any other another action request with not yet completed related procedures.

5.3 MTC-IWF selection

To discover the MTC-IWF with which to establish the Tsp session, the SCS may use:

- a pre-configured MTC-IWF identity
- DNS
- Diameter routing

For DNS, the Domain Name System procedures as specified in TS 29.303 [13] may be used by the SCS for MTC-IWF selection. The External Identifier is defined in TS 23.003 [14] and is composed of Domain Identifier and Local Identifier. The DNS query can be performed deriving the domain name to be resolved from the Domain Identifier part of the External Identifier.

For Diameter Routeing, the Destination Realm should be derived from the Domain Identifier part of the External Identifier.

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5.4 MTC-IWF load control

Upon receiving a device action request from the SCS:

- if the MTC-IWF determines that the SCS has reached or exceeded the quota of Tsp requests that it is allowed to send, the MTC-IWF may respond to the SCS with a Device-Action-Answer command containing the Request-Status AVP with the value set to QUOTAEXCEEDED.
- if the MTC-IWF determines that the SCS has exceeded its rate of initiating Tsp requests, the MTC-IWF may respond to the SCS with a Device-Action-Answer command containing the Request-Status AVP with a value set to RATEEXCEEDED.
- if the MTC-IWF is in an overload condition, the MTC-IWF may respond to the SCS with a Device-Action-Answer command containing the Result-Code AVP with the value set to DIAMETER_TOO_BUSY, see IETF RFC 6733 [18].

For the above cases, the SCS on receiving the response from MTC-IWF, may provide an indication of the failed request to the application requesting services to the SCS.

Alternatively, for RATEEXCEEDED and DIAMETER_TOO_BUSY, the SCS may implement a backoff timer which when running the SCS does not initiate Tsp requests to the MTC-IWF. Once the timer expires, the SCS may attempt to use the MTC-IWF which was formerly in an overload condition or for which SCS had exceeded the rate of Tsp requests. The algorithm the SCS uses for the backoff timer is out of scope of the 3GPP specification.

5.5 Request and confirmation of a device trigger

In order to request the MTC-IWF to perform a device trigger, the SCS shall send a Device-Action-Request command with the following AVP values within the Device-Action AVP:

a) Action-Type AVP set to the value Device Trigger Request (1).

b) Either MSISDN AVP or External-Id AVP set to the identifier of the MTC device to be triggered.

c) SCS-Identity AVP, containing the identity of the SCS that is requesting a device trigger to the UE.

d) Reference-Number AVP, containing a newly assigned reference number the SCS has assigned to the specific action request.

e) Trigger-Data AVP containing data to be sent to the MTC device with the trigger by the MTC-IWF in the Payload AVP, priority of the trigger in the Priority-Indication AVP and the triggering application addressed in the device indicated in the Application-Port-Identifier AVP.

f) Validity-Time AVP, indicating the validity time of the device trigger request since the time the device action request has been received by the MTC-IWF.

After the MTC-IWF has received from the SCS a Device-Action-Request command with device action set to Device Trigger Request (1), after receiving the Device-Trigger-Answer from SMS-SC, the MTC-IWF shall confirm the status of a device trigger request to the SCS by sending a Device-Action-Answer command and shall include the following AVP values within the Device-Notification AVP:

a) Action-Type AVP set to the value Device Trigger Request (1).

b) Reference-Number AVP, containing the reference number received from the SCS for the specific action request.

c) Request-Status AVP set to value indicating the status of the device trigger request requested by the SCS.

The MTC-IWF may also include the following AVP within the Device-Notification AVP:

a) Either MSISDN AVP or External-Id AVP set to the identifier of the MTC device to be triggered.

b) SCS-Identity AVP, containing the identity of the SCS that requested a device trigger to the UE.

If the MTC-IWF concludes that it needs to abort the device trigger, it shall indicate the unsuccessful outcome with the Request-Status AVP and may release the reference number received from the SCS for the specific action request.

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