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Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Subscriber and equipment trace;
Trace concepts and requirements
(3GPP TS 32.421 version 15.3.0 Release 15)

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Foreword

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Introduction

The present document is part of a TS-family covering the 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management, as identified below:

TS 32.421: "Subscriber and equipment trace: Trace concepts and requirements";

TS 32.422: "Subscriber and equipment trace: Trace control and configuration management";

TS 32.423: "Subscriber and equipment trace: Trace data definition and management";

Subscriber and equipment trace provide very detailed information at call level on one or more specific mobile(s). This data is an additional source of information to Performance Measurements and allows going further in monitoring and optimisation operations.

Contrary to Performance measurements, which are a permanent source of information, trace is activated on user demand for a limited period of time for specific analysis purposes.

Trace plays a major role in activities such as determination of the root cause of a malfunctioning mobile, advanced troubleshooting, optimisation of resource usage and quality, RF coverage control and capacity improvement, dropped call analysis, Core Network and Access Network end-to-end procedure validation.

The capability to log data on any interface at call level for a specific user (e.g. IMSI) or mobile type (e.g. IMEI or IMEISV), or service initiated by a user allows getting information which cannot be deduced from Performance measurements such as perception of end-user QoS during his call (e.g. requested QoS vs. provided QoS), correlation between protocol messages and RF measurements, or interoperability with specific mobile vendors.

Moreover, performance measurements provide values aggregated on an observation period; Subscriber and UE Trace give instantaneous values for a specific event (e.g. call, location update, etc.).

If performance measurements are mandatory for daily operations, future network planning and primary trouble shooting; Subscriber and UE Trace is the easy way to go deeper into investigation and network optimisation.

In order to produce this data, Subscriber and UE Trace are carried out in the NEs, which comprise the network. The data can then be transferred to an external system (e.g. an Operations System (OS) in TMN terminology, for further evaluation).

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1 Scope

The present document describes the requirements for the management of Trace and the reporting of Trace data (including FDD mode and TDD mode) across UMTS, EPS or 5G networks as it refers to subscriber tracing (tracing of IMSI or Public User Identity) and equipment tracing (tracing of IMEI or IMEISV). Trace also includes the ability to trace all active calls in a cell or multiple cells (Cell Traffic Trace). The present document also includes the description of Service Level Tracing (tracing of a specific service). It defines the administration of Trace Session activation/deactivation by the management system, the network or User Equipment (UE) itself via signalling, the generation of Trace results in the Network Elements (NEs) and UE and the transfer of these results to one or more Operations Systems.

GSM Trace is outside of the scope of this specification (see [7]).

The present document also describes the requirements for the management of Minimization of Drive Tests (MDT) across UMTS networks, EPS networks or 5G networks and Radio Link Failure (RLF) reporting across EPS networks and 5G networks.

The present document is built upon the basic Subscriber and UE Trace concept described in clause 4.
The high-level requirements for Trace data, Trace Session activation/deactivation and Trace reporting are defined in clause 5. Clause 5 also contains an overview of use cases for Trace (the use cases are described in Annex A). Clause 6 defines the requirements for managing MDT. Clause 7 defines the requirements for managing RLF reports.Trace control and configuration management are described in 3GPP TS 32.422 [2], and Trace data definition and management are described in 3GPP TS 32.423 [3].

The present document does not cover any Trace capability limitations within a NE (e.g. maximum number of simultaneous traced mobiles for a given NE) or any functionality related to these limitations (e.g. NE aborting a Trace Session due to resource limitations).

The objectives of the Trace specifications are:

a) to provide the descriptions for a standard set of Trace and MDT data;

b) to produce a common description of the management technique for Trace, MDT and RLF administration and result reporting;

c) to define a method for the reporting of Trace, MDT and RLF results across the management interfaces.

The following is beyond the scope of the present document, and therefore the present document does not describe:

- tracing non-Subscriber or non-UE related events within an NE;
- tracing of all possible parties in a multi-party call (although multiple calls related to the IMSI specified in the Trace control and configuration parameters are traceable).

The definition of Trace and MDT data is intended to result in comparability of Trace and MDT data produced in a multi-vendor wireless UMTS, EPS and/or 5G network(s), for those Trace control and configuration parameters that can be standardised across all vendors' implementations.

Vendor specific extensions to the Trace control and configuration parameters and Trace and MDT data are discussed in 3GPP TS 32.422 [2] and 3GPP TS 32.423 [3].

All functions (trace, MDT etc.) specified in this specification support Network Sharing, with the following conditions:

- It is accepted that the recorded information from the shared nodes is available to the Master Operator. Recorded information that is collected in a non shared node or cell will only be available to the operator managing the non shared node or cell.
- It is accepted that the recorded information from the shared network shall be delivered to the Participating Operator whose PLMN recording is requested, taking user consent into account. Operators must also agree on sharing the information, but how that agreement is done is outside the scope of this specification. The mapping of TCE IP addresses and TCE addresses must be coordinated among the operators that shares the network. How that coordination is done is outside the scope of this specification.

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- It is accepted that the inter-PLMN recorded information for Logged MDT from the non-shared nodes of Participating Operators may be available to the Master Operator.
- For signalling based activation, the operators that share a network must coordinate the TCE IP addresses and the TCE address mapping must be coordinated. How that coordination´ is done is outside the scope of this specification.
- The 3GPP Managment reference model, 3GPP TS 32.101 [1] is followed.

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 TS 32.101: "Telecommunication management; Principles and high level requirements".

[2] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace: Trace control and configuration management".

[3] 3GPP TS 32.423: "Telecommunication management; Subscriber and equipment trace: Trace data definition and management".

[4] 3GPP TS 23.002: "Network architecture".

[6] 3GPP TS 29.207: "Policy control over Go interface".

[7] 3GPP TS 52.008: "Telecommunication management; GSM subscriber and equipment trace".

[8] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[9] OMA Service Provider Environment Requirements, OMA-RD-OSPE-V1_0-20050614-C, The Open Mobile Alliance™ (URL:http://www.openmobilealliance.org/).

[10] 3GPP TS 33.401: "System Architecture Evolution (SAE); Security architecture".

[11] 3GPP TS 37.320 : "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description, Stage 2".

[12] 3GPP TS 32.450: "Key Performance Indicators (KPI) for Evolved Universal Terrestrial Radio Access Network (E-UTRAN): Definitions".

[13] 3GPP TS 32.130: "Network sharing; Concepts and requirements".

[14] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[15] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[16] 3GPP TS 38.300: "NR and NG-RAN Overall Description; Stage 2".

[17] 3GPP TS 38.401: "NG-RAN; Architecture Description".

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[18] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

[19] 3GPP TS 25.331: "Radio Resource Control (RRC); protocol specification".

NOTE: Overall management principles are defined in 3GPP TS 32.101 [1].

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 21.905 [8] , 32.130 [13], 23.501 [15], 38.300 [16] and the following apply:

Cell Traffic Trace: The ability to trace one or more active calls in one or more cells.

Collection Period: Period that indicates the measurement results collection interval.

NOTE: The measurement results can refer to the *MeasResults* IE defined in clause 6.3.5, 3GPP TS 36.331 [18] for LTE or *MeasuredResults* IE defined in clause 11.3, 3GPP TS 25.331[19] for UMTS.

End user visible events: Refer to OMA Service Provider Requirements [9].

Immediate MDT: See 3GPP TS 37.320 [11].

Logged MDT: See 3GPP TS 37.320 [11].

management activation/deactivation: Trace Session is activated/deactivated in different NEs directly from the EM using the management interfaces of those NEs.

MDT Measurements: See 3GPP TS 37.320 [11].

MBSFN Area: See 3GPP TS 36.300 [14].

MBSFN Area Reserved Cell: See 3GPP TS 36.300 [14].

Signalling Based Activation/Deactivation: Trace Session is activated/deactivated in different NEs using the signalling interfaces between those elements so that the NEs may forward the activation/deactivation originating from the EM

System Context: two different realisations of the telecommunication management architecture. System Context A has the Itf-N between a Network Manager and an Element Manger. System Context B has the Itf-N between a Network Manager and a Network Element that has an embedded Element Manager. See figure 1 in TS 32.101 [1].

Measurement Period: Period that indicates the performance measurement reporting interval.

Trace: general term used for Subscriber, Equipment and Service Trace.

Trace record: in the NE a Trace record is a set of Traceable data collected as determined by the Trace control and configuration parameters.

Trace Recording Session: time interval within a Trace Session while trace records are generated for the Subscriber, UE or Service being traced. The triggering events starting and stopping a Trace Recording Session are defined in 3GPP TS 32.422 [2] (see figure 1).

Trace Recording Session Reference: identifies a Trace Recording Session within a Trace Session (see figure 1)

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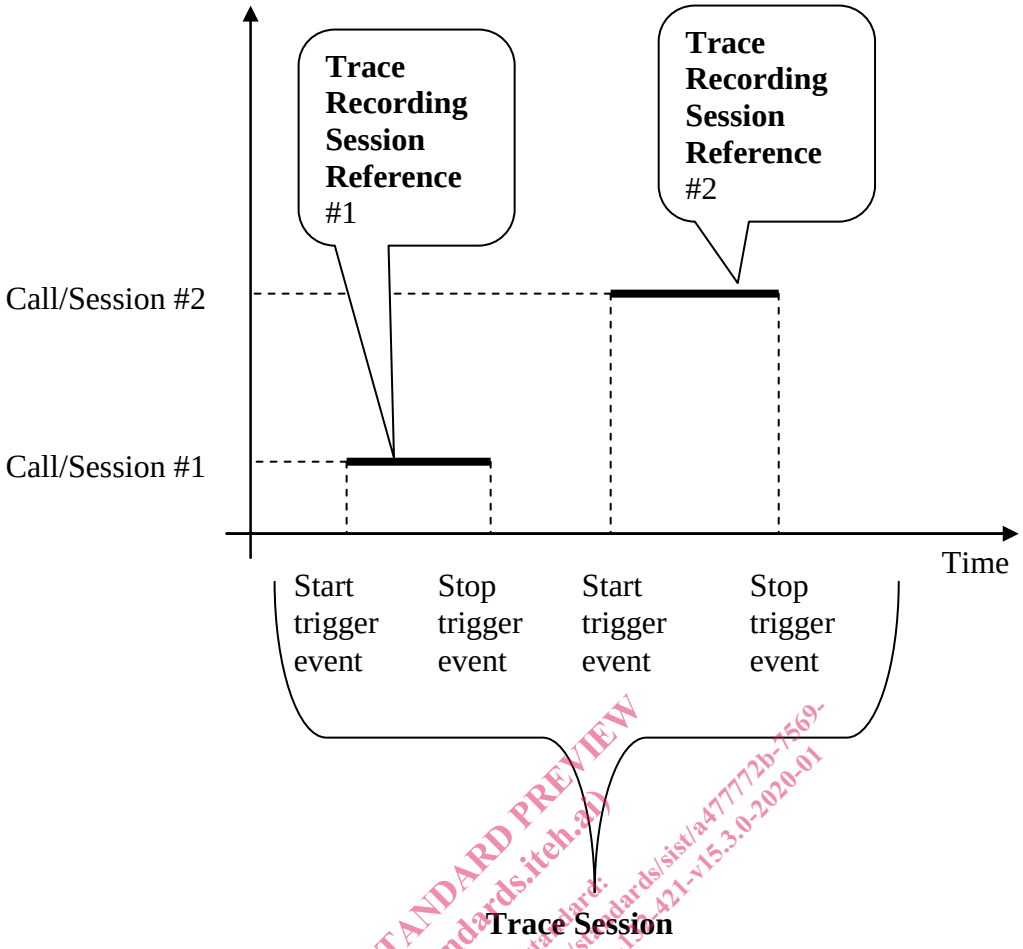

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Figure 1: Trace Recording Session

Note that overlapping calls/sessions are possible for e.g. Cell Traffic Trace.

Trace Reference: identifies a Trace Session and is globally unique (see figure 2)

Trace Session: time interval started with a Trace Session Activation and lasts until the Deactivation of that specific Trace Session (see figure 2)

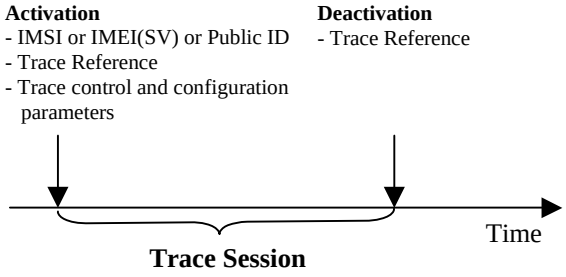

Figure 2: Trace Session

Trace Parameter Configuration: a technique whereby a request for tracing a certain Subscriber, UE or Service is sent by the EM to the NE for execution.

Trace Parameter Propagation: a technique by which the NE processes the trace configuration (received from the EM or another NE) and sends it to the relevant Network Element(s) via signalling interface(s).

Service Level Tracing: Refer to OMA Service Provider Requirements [9].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 21.905 [8], 32.101 [1] , 32.130 [13] , 23.501 [15], 38.300 [16] and the following apply:

MBSFN	MBMS over a Single Frequency Network
MBMS	Multimedia Broadcast Multicast Services
MDT	Minimization of Drive Tests
RCEF	RRC Connection Establishment Failure
RLF	Radio Link FailureTCE Trace Collection Entity

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