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5G;  
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Quality of Experience (QoE) measurement collection;  
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# Foreword

This Technical Specification 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.

---

## Introduction

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

TS 28.404: "Quality of Experience (QoE) measurement collection; Concepts, use cases and requirements";

TS 28.405: "Quality of Experience (QoE) measurement collection; Control and configuration";

**TS 28.406: "Quality of Experience (QoE) measurement collection; Information definition and transport".**

One main motivation of the mobile network evolution is to improve the user experience, which is why the evaluation of the user experience? at the UE side is vital to network operators. This is especially true when the operators provide high bit rate real-time services like streaming services (typically video services), where even intermittent quality degradation is very annoying. Many of these streaming services are a significant part of the commercial traffic growth rate, therefore the focus is on the end users' experience.

Quality of Experience (QoE) information collection provides detailed information at session level on a number of UEs.

The capability to log information within a UE, and in particular the QoE of an end user service, initiated by an operator, provides the operator with QoE information. The collected information (specified in 3GPP TS 26.247 [7]) cannot be deduced from performance measurements in the mobile network.

The QoE information is information collected by the end user application in the UE.

The QoE information is collected by the management system for analysis and/or KPI calculations.

---

# 1 Scope

The present document describes Quality of Experience (QoE) measurement collection record content definition and management. It covers the Quality of Experience (QoE) measurement data content, their format and transfer across UMTS networks, LTE networks, and NR networks. The measurements that are collected are DASH [7], MTSI [8], and VR [9] measurements.

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# 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 28.404: "Quality of Experience (QoE) measurement collection; Concepts, use cases and requirements".
- [3] 3GPP TS 28.405: "Quality of Experience (QoE) measurement collection; Control and configuration".
- [4] 3GPP TS 28.307: "Telecommunication management; Quality of Experience (QoE) measurement collection Integration Reference Point (IRP); Information Service (IS)".
- [5] 3GPP TS 28.308: "Management of Quality of Experience (QoE) measurement collection Integration Reference Point (IRP); Information Service (IS)".
- [6] 3GPP TS 25.331: "Radio Resource Control (RRC) protocol specification".
- [7] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".
- [8] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction".
- [9] 3GPP TS 26.118: "Virtual Reality (VR) profiles for streaming applications".

---

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms 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

Void.

## 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].

3GP	3GPP file format
3GP-DASH	3GPP Dynamic Adaptive Streaming over HTTP
MPD	Media Presentation Description
MTSI	Multimedia Telephony Service for IMS
QMC	QoE Measurement Collection
QoE	Quality of Experience
VR	Virtual Reality

---

## 4 QoE record contents

### 4.1 General

The QoE record may contain QoE metrics for 3GP-DASH and MTSI.

### 4.2 QoE metrics for 3GP-DASH

#### 4.2.1 QoE Metric Definitions

##### 4.2.1.1 Introduction

This clause provides the general QoE metric definitions and measurement framework.

The semantics are defined using an abstract syntax. Items in this abstract syntax have one of the following primitive types (*Integer*, *Real*, *Boolean*, *Enum*, *String*) or one of the following compound types:

- *Objects*: an unordered sequence of (*key*, *value*) pairs, where the key always has string type and is unique within the sequence.
- *List*: an ordered list of items.
- *Set*: an unordered set of items.

Additionally, there are two kinds of timestamp defined, i.e. *real time* (wall-clock time) and *media time*.

##### 4.2.1.2 Representation Switch Events

Clause 10.2.3 in TS 26.247 [7] defines the metrics for representation switch events.

##### 4.2.1.3 Average Throughput

Clause 10.2.4 in TS 26.247 [7] defines the metric for average throughput.

##### 4.2.1.4 Initial Playout Delay

Clause 10.2.5 in TS 26.247 [7] defines the metric for initial playout delay.

##### 4.2.1.5 Buffer Level

Clause 10.2.6 in TS 26.247 [7] defines the metrics for buffer level status events.



#### 4.2.1.6 Play List

Clause 10.2.7 in TS 26.247 [7] defines the metric for play list.

#### 4.2.1.7 MPD Information

Clause 10.2.8 in TS 26.247 [7] defines the metric for MPD information.

#### 4.2.1.8 Playout Delay for Media Start-up

Clause 10.2.9 in TS 26.247 [7] defines the metric for playout delay for Media Start-up.

#### 4.2.1.9 Device information

Clause 10.2.10 in TS 26.247 [7] defines the metric for playout delay for device information.

### 4.2.2 Quality Metrics for Progressive Download

The following metrics shall be supported by progressive download clients supporting the QoE reporting feature:

- Average Throughput (Clause 4.2.1.3),
- Initial Playout Delay (Clause 4.2.1.4),
- Buffer Level (Clause 4.2.1.5),
- Play List (Clause 4.2.1.6), and
- Device information (Clause 4.2.1.9).

### 4.2.3 Quality Metrics for DASH

The following metrics shall be supported by 3GP-DASH clients supporting the QoE reporting feature:

- List of Representation Switch Events (Clause 4.2.1.2).
- Average Throughput (Clause 4.2.1.3).
- Initial Playout Delay (Clause 4.2.1.4).
- Buffer Level (Clause 4.2.1.5).
- Play List (Clause 4.2.1.6).
- MPD Information (Clause 4.2.1.7).
- Device information (Clause 4.2.1.9).

The @metrics attribute contains a list of quality metric keys listing all metrics that the DASH shall collect and report.

The semantics of the attributes within the **Metrics** element are provided in Table 1. The XML-syntax of a **Metrics** element is provided in Table 2.

Table 1: Semantics of Metrics element

Element or Attribute Name	Use	Description
<b>Metrics</b>		DASH metric element
@metrics	M	This attribute lists all quality metrics (as a list of quality metric keys as defined in clause 4.2.1.1, separated by a whitespace) that the client shall report. Certain keys allow specifying a measurement interval or period over which a single value of the metric is derived and potentially also other parameters controlling the collection of the metrics. The parameters, if any, are included in parenthesis after the key and their semantics are specified in clause 4.2.1.1 with the metric definition itself.
<b>Range</b>	0...N	When specified, it indicates the time period during which quality metric collection is requested. When not present, quality metric collection is requested for the whole duration of the content.
@starttime	O	When specified, it indicates the start time of the quality metric collection operation. When not present, quality metric collection is requested from the beginning of content consumption. For services with <b>MPD@type</b> "Live", the start time of quality metric collection can be obtained in wallclock time by adding the value of this attribute indicated in media time to the value of the <b>MPD@availabilityStartTime</b> attribute. For services with <b>MPD@type</b> "OnDemand", the start time is indicated in media time and is relative to the <i>PeriodStart</i> time of the first period in this MPD.
@duration	O	When specified, it indicates the duration of the quality metric collection period. The value of this attribute is expressed in media time.
<b>Reporting</b>	1...N	Descriptors that provide information about the requested Quality Reporting method and formats, and Auxiliary Reporting method and format.
<b>Legend:</b> For attributes: M=Mandatory, O=Optional, OD=Optional with Default Value, CM=Conditionally Mandatory. For elements: <minOccurs>...<maxOccurs> (N=unbounded) Elements are <b>bold</b> ; attributes are non-bold and preceded with an @.		

Table 2: XML-Syntax of Metrics element

```

<!-- QoE Collection and Reporting -->
<xs:complexType name="MetricsType">
  <xs:sequence>
    <xs:element name="Reporting" type="DescriptorType" maxOccurs="unbounded"/>
    <xs:element name="Range" type="RangeType" minOccurs="0" maxOccurs="unbounded"/>
    <xs:any namespace="##other" processContents="lax" minOccurs="0"
maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="metrics" type="xs:string" use="required"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

<xs:complexType name="RangeType">
  <xs:sequence>
    <xs:any namespace="##other" processContents="lax" minOccurs="0"
maxOccurs="unbounded"/>
  </xs:sequence>
  <xs:attribute name="startTime" type="xs:duration" use="optional"/>
  <xs:attribute name="duration" type="xs:duration" use="required"/>
  <xs:anyAttribute namespace="##other" processContents="lax"/>
</xs:complexType>

```

## 4.3 QoE metrics for MTSI

### 4.3.1 Metrics Definition

An MTSI client supporting the QoE metrics feature shall support the reporting of the metrics in this clause. The metrics are valid for speech, video and text media, and are calculated for each measurement resolution interval "Measure-Resolution". They are reported to the server according to the measurement reporting interval "Sending-Rate" and after the end of the session.

#### 4.3.1.1 Corruption duration metric

Clause 16.2.1 in TS 26.114 [8] defines the metric for corruption duration.

#### 4.3.1.2 Successive loss of RTP packets

Clause 16.2.2 in TS 26.114 [8] defines the metric for successive loss of RTP packets.

#### 4.3.1.3 Frame rate

Clause 16.2.3 in TS 26.114 [8] defines the metric for frame rate.

#### 4.3.1.4 Jitter duration

Clause 16.2.4 in TS 26.114 [8] defines the metric for jitter duration.

#### 4.3.1.5 Sync loss duration

Clause 16.2.5 in TS 26.114 [8] defines the metric for sync loss duration.

#### 4.3.1.6 Round-trip time

Clause 16.2.6 in TS 26.114 [8] defines the metric for round-trip time.

#### 4.3.1.7 Average codec bitrate

Clause 16.2.7 in TS 26.114 [8] defines the metric for average codec bitrate.

#### 4.3.1.8 Codec information

Clause 16.2.8 in TS 26.114 [8] defines the metric for codec information.

## 4.4 QoE metrics for VR

### 4.4.1 QoE Metric Definitions

#### 4.4.1.1 Introduction

VR metrics is a functionality where the client collects specific quality-related metrics during a session. These collected metrics can then be reported back to a network side node for further analysis. The metric functionality is based on the QoE metrics concept in 3GP-DASH. The QoE metrics specified in clause 4.2 also apply to VR measurement. This clause only covers the further extended specific metrics. A VR client supporting VR metrics shall support all metrics listed in clause 4.2 and this clause.

#### 4.4.1.2 Comparable quality viewport switching latency

Clause 9.3.2 in TS 26.118 [9] defines the metrics for comparable quality viewport switching latency.

#### 4.4.1.3 Rendered viewports

Clause 9.3.3 in TS 26.118 [9] defines the metrics for Rendered viewports.

#### 4.4.1.4 VR Device information

Clause 9.3.4 in TS 26.118 [9] defines the metrics for VR Device information.

## Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-10	SA5#127	S5-196170 S5-196171				Add Introduction Add scope and reference	0.1.0
2019-11	SA5#127					Used new TS template	0.1.1
2020-03	SA5#129e	S5-201404				Remove SBA	0.2.0
2020-04	SA5#130e	S5-202010				Add definitions of terms, symbols and abbreviations	0.3.0
2020-04	SA5#130e	S5-202406				Add QoE record contents	0.3.0
2020-06						Corrections for editHelp (editorial and introduction of explanation of modal verbs).	0.3.1
2020-06	SA#88-e	SP-200477				Presented for information and approval	1.0.0
2020-07	SA#88e					Upgrade to change control version	16.0.0
2022-03	-	-	-	-	-	Update to Rel-17 version (MCC)	17.0.0
2024-03	SA#103	SP-240167	0001	-	F	Rel-18 CR TS28.406 Adding QoE Metrics for VR	18.0.0

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# History

<b>Document history</b>		
V18.0.0	May 2024	Publication