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Technical Report

Speech and multimedia Transmission Quality (STQ); QoS Parameter Measurements based on fixed Data Transfer Times

ETSI

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Speech and multimedia Transmission Quality (STQ).

Introduction

The present document defines QoS parameters and the corresponding measurement and evaluation procedures as a supplement to the ones defined in TS 102 250-2 [i.1].

For the QoS parameters proposed in this document the term Fixed Data Transfer Time QoS (FDTT-QoS) parameters is used.

The main purpose of proposing the concept of FDTT-QoS parameters is to fulfil the common request for many QoS measurements to have a limited and regular run time for individual measurement tasks. Due to the wide range of uplink and downlink throughput in modern mobile communication networks, limited and regular run times cannot be provided when having e.g. fixed object (file) sizes for the measurements.

Limited runtime is required to ensure that all measurement tasks are finished before the data window ends, where the term data window is used to define the time period from the start of one data session (containing one or several measurement tasks) to the start of the next data session and the time duration of the data window is set to a constant value. For example a data session consists of 3 measurement tasks - FTP DL, FTP UL and HTTP. Limited time for each task (e.g. 30 s) ensures, that the data session will be completed in 3×30 s and all tasks (FTP DL, FTP UL and HTTP) will be performed.

Regular run time is required to ensure that a minimum percentage of the data window is used for measurements.

This document describes how the requirement of regular and limited runtime can be achieved by using these FDTT-QoS parameters for data measurements, especially for FTP and HTTP data transfers.

Advantages of the FDTT-QoS parameters and measurement method:

- Low variation between minimum and maximum measurement time. This is important if measurements are done in regular intervals.

- Required measurement time for slow connections is reduced while maintaining the accuracy for high speed connections.

- Better distribution of measurements in drive tests. Using FDTT-QoS measurements, the same number of tasks or job executions per time interval can be achieved regardless of the network access technology.

- Better resource utilization. To determine the throughput a certain time is required as several processes in the network are time dependent. Thus, a time based measurement concept for throughput measurements has the advantage of providing reliable measurement values for fast connections while not wasting network capacity for slow connections.

List of QoS parameters from TS 102 250-2 [i.1] for which supplement definitions in terms of FDTT-QoS parameters are provided within this document:

- FTP {Download|Upload} Mean Data Rate [kbit/s];

- FTP {Download|Upload} Data Transfer Cut-Off Ratio [%];

- HTTP Mean Data Rate [kbit/s];

- HTTP Data Transfer Cut-Off Ratio [%].

1 Scope

The present document defines QoS parameters and the corresponding measurement and evaluation procedures as a supplement to the ones defined in TS 102 250-2 [i.1].

This document discusses the concept of Fixed Data Transfer Time QoS (FDTT-QoS) parameters, their methods and validity rules and describes how the requirement of regular and limited runtime can be achieved by using the FDTT-QoS parameters for data measurements, especially for FTP and HTTP data transfers.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:

    - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;

    - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

[i.1] ETSI TS 102 250-2: "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in GSM and 3G networks; Part 2: Definition of Quality of Service parameters and their computation".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the ETSI Directives and the following apply:

Fixed Data Transfer Time QoS (FDTT-QoS) parameters: QoS parameters which are defined as supplement to selected QoS parameters from TS 102 250-2 [i.1] related to FTP and HTTP

NOTE: Under special circumstances FDTT-QoS parameters have some benefits compared to QoS from TS 102 250-2 [i.1].

3.2 Symbols

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

Δt_d Predefined, fixed period of time used for data transfer measurement in the FDTT-QoS concept

3.3 Abbreviations

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

FDTT-QoS   Fixed Data Transfer Time QoS
FTP DL   File Transfer Protocol - Downlink Direction
FTP UL   File Transfer Protocol - Uplink Direction
FTP   File Transfer Protocol
HTTP   Hyper Text Transfer Protocol
QoS   Quality of Service
RAT   Radio Access Channel
TCP   Transmission Control Protocol

4 FDTT-QoS General Concept

4.1 Concept of FDTT-QoS

The concept of the FDTT-QoS family performance indicators is based on measurements of the performance for a predefined time period (Δt_d) instead of measurements with defined objects (measurement files)

EXAMPLE: For the measurements of FTP DL not a file with a defined size is used but the duration for downloading data via FTP is defined. After reaching the end of the transfer period (Δt_d elapsed), the amount of transferred data and the average throughput is calculated.

- The family of FDTT-QoS parameters is defined for FTP DL, FTP UL and HTTP.

- The end of the measurement is defined by reaching the end of the transfer period Δt_d.

- Throughput is calculated as the total number of bytes received at the application level (FTP or HTTP level) during the time interval Δt_d.

- For FTP measurements, files should be used with a size big enough not to be completely downloaded/uploaded before reaching the end of the transfer period Δt_d.

- For HTTP measurements a measurement web page (e.g. Copernicus) should be downloaded repeatedly until the end of the transfer period Δt_d is reached or alternatively, a file should be downloaded with a size big enough not to be completely downloaded before reaching the end of the transfer period Δt_d.

- It is recommended to set Δt_d to a value appropriate for the purpose of the measurement, e.g. to take into consideration the influence of TCP slow start mechanism.

- When the end of the transfer period $\Box$td is reached the connection should be ended gracefully, e.g. using a close command on socket level producing TCP message FIN.

- The connection should be checked to be still alive at the end of the transfer period $\Box$td . For performing the check the ACK response message to the FIN message at the end of the connection should be used. Timeout to wait for the ACK message should be set to 3-5 multiples of typical RTT time in the measured network.

- A successfully terminated data transfer is considered as a data transfer which is ended within the connection which is checked as alive before end of the transfer period $\Box$td.

- A measurement task where the connection is not alive after the end of the transfer period $\Box$td should not be used for calculating of data transfer rate statistics.

For different types of services (FTP DL, FTP UL, and HTTP) the start triggers for data transfer are adopted from TS 102 250-2 [i.1]. However, the amount of transferred data is counted only until the predefined time period Δt_d has elapsed since the respective start event. A QoS parameter (download or upload throughput) is then calculated as this amount of data (received or sent on application level) divided by the time period Δt_d.

Diagrams for FTP DL, FTP UL and HTTP are shown within clauses 4.2.1 to 4.2.3.

4.2   Event diagrams

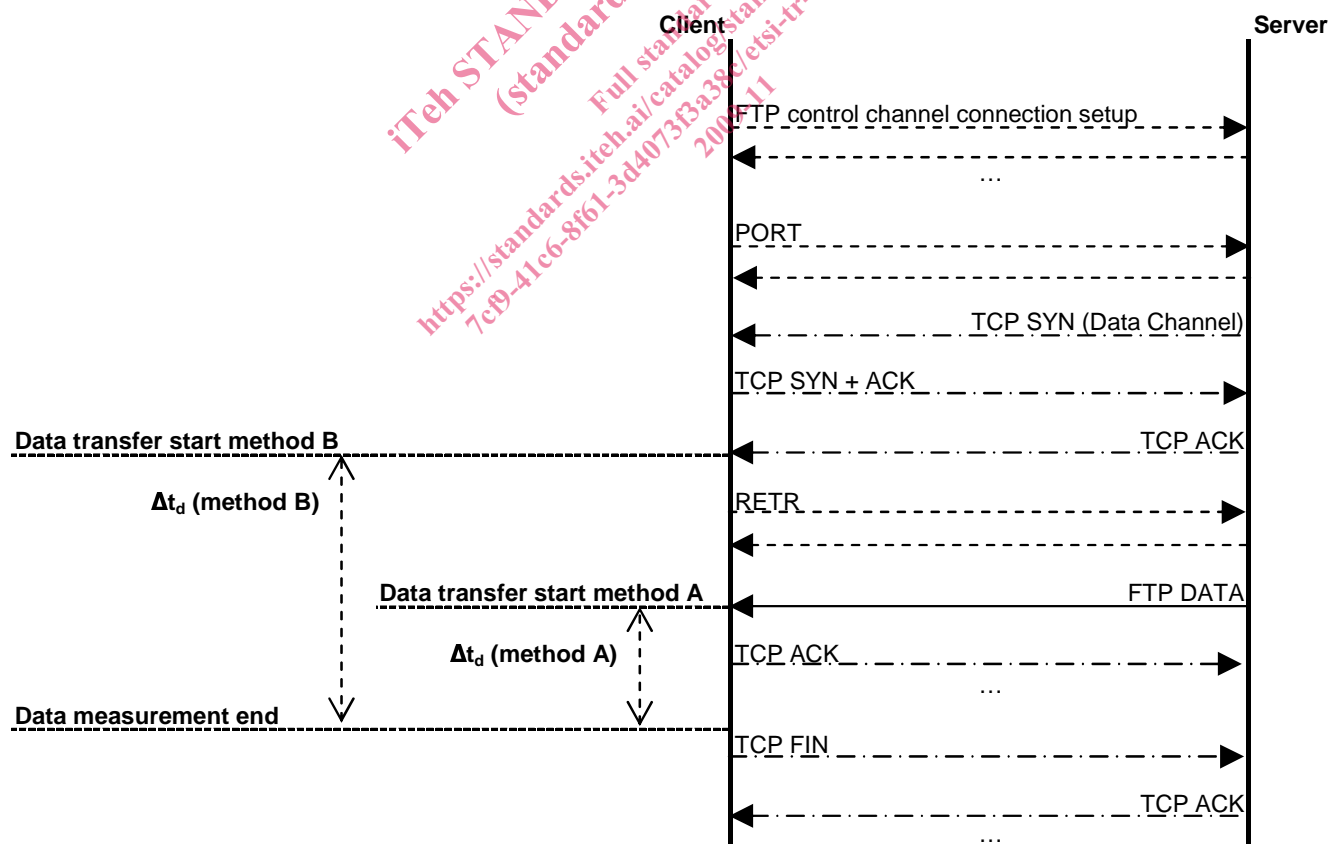## 4.2.1   Diagram of Events for FTP download, active mode

**Figure 1: Diagram of Events for FTP download, active mode,
includes both Data transfer start methods A and B**

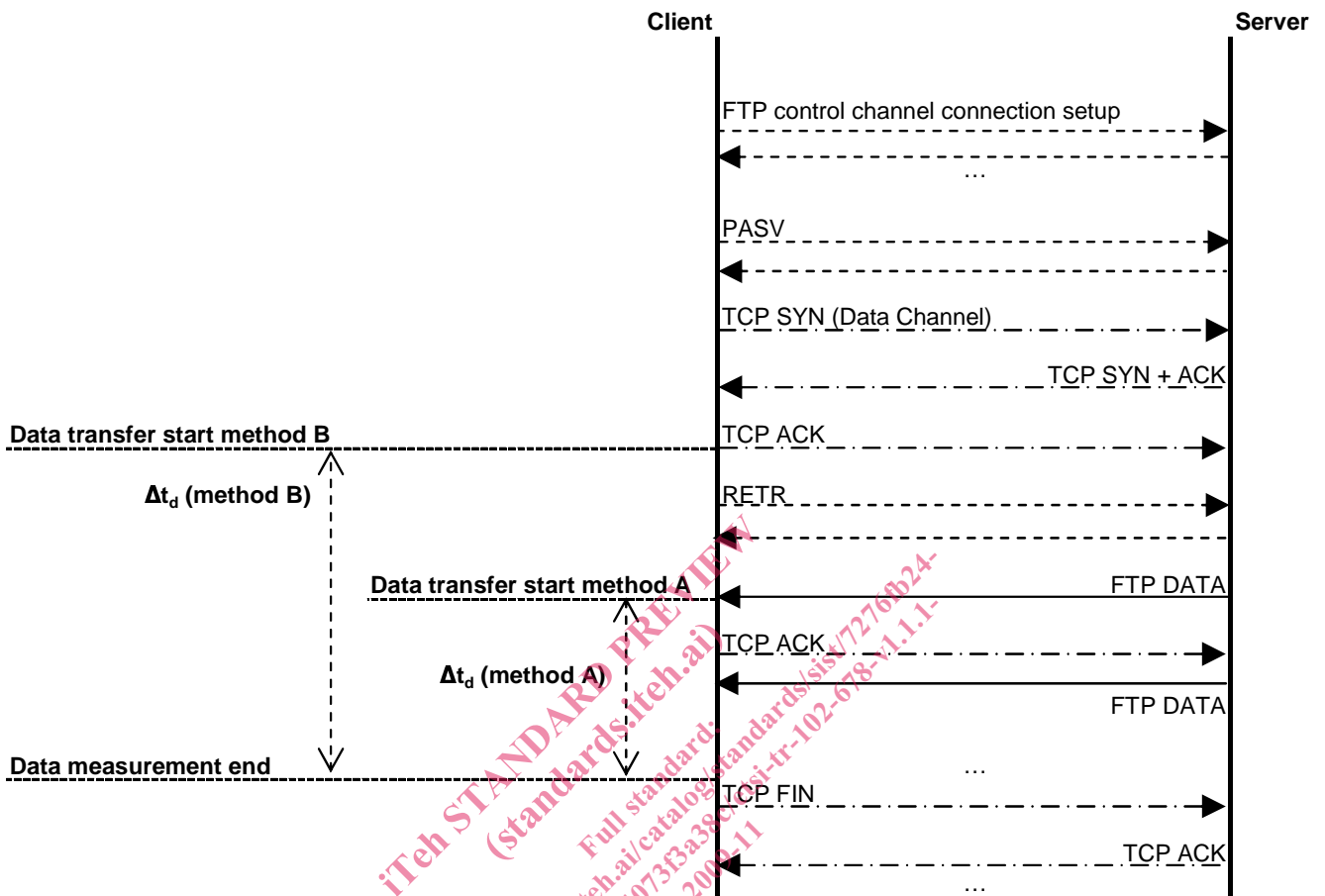## 4.2.2 Diagram of Events for FTP download, passive mode

**Figure 2: Diagram of Events for FTP download, passive mode,
includes both Data transfer start methods A and B**