

ETSI TS 128 403 V16.0.0 (2020-08)



**Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Performance Management (PM);
Performance measurements
for Wireless Local Area Network (WLAN)
(3GPP TS 28.403 version 16.0.0 Release 16)**



Reference

RTS/TSGS-0528403vg00

Keywords

LTE,UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2020.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M™ logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	4
Introduction	4
1 Scope	5
2 References	5
3 Definitions and abbreviations.....	5
3.1 Definitions	5
3.2 Abbreviations	6
4 Measurement family.....	6
5 Measurements related to WLAN.....	6
5.1 Measurements related to WLAN AP data volume	6
5.1.1 Number of incoming unicast IP packets received at WLAN AP	6
5.1.2 Number of outgoing unicast IP packets transmitted by WLAN AP	6
5.1.3 Number of incoming multicast IP packets received at WLAN AP.....	7
5.1.4 Number of outgoing multicast IP packets transmitted by WLAN AP	7
5.1.5 Number of incoming broadcast IP packets received at WLAN AP	7
5.1.6 Number of outgoing broadcast IP packets transmitted by WLAN AP	8
5.2 Measurements related to CSMA/CA protocol.....	8
5.2.1 Number of successful RTS responses	8
5.2.2 Number of failed RTS responses	8
5.2.3 Number of failed ACK responses	8
5.3 Measurements related to WLAN data packets	9
5.3.1 Number of successful MPDU receptions	9
5.3.2 Number of failed MPDU receptions	9
5.4 Measurements related to station association	9
5.4.1 Number of associated stations	9
Annex A (informative): Use cases for performance measurements definition.....	11
A.1 Use case for WLAN AP data volume related measurements	11
A.2 Use case for CSMA/CA protocol related measurements	11
A.3 Use case for WLAN data packets related measurements	11
A.4 Use case for station association measurements	11
Annex B (informative): Change history	12
History	13

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.

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:

- 32.401 Performance Management (PM); Concept and requirements
- 52.402 Performance Management (PM); Performance measurements – GSM
- 32.404 Performance Management (PM); Performance measurements - Definitions and template
- 32.405 Performance Management (PM); Performance measurements Universal Terrestrial Radio Access Network (UTRAN)
- 32.406 Performance Management (PM); Performance measurements Core Network (CN) Packet Switched (PS) domain
- 32.407 Performance Management (PM); Performance measurements Core Network (CN) Circuit Switched (CS) domain
- 32.408 Performance Management (PM); Performance measurements Teleservice
- 32.409 Performance Management (PM); Performance measurements IP Multimedia Subsystem (IMS)
- 32.425 Performance Management (PM); Evolved Performance measurements Universal Terrestrial Radio Access Network (E-UTRAN)
- 32.426 Performance Management (PM); Evolved Packet Core (EPC)
- 28.401 Telecommunication management; Performance Management (PM); Performance measurements for Core Network (CN) and non-3GPP access Interworking System
- 28.402 Telecommunication management; Performance Management (PM); Performance measurements for Evolved Packet Core (EPC) and non-3GPP access Interworking System
- 28.403 Performance Management (PM); Performance measurements for Wireless Local Area Network (WLAN)**

1 Scope

The present document describes the measurements for WLAN.

TS 32.401 [3] describes Performance Management concepts and requirements.

The present document is valid for all measurement types provided by an implementation of a WLAN.

Only measurement types that are specific to WLAN are defined within the present document. Vendor specific measurement types used in WLAN are not covered. Instead, these could be applied according to manufacturer's documentation.

Measurements related to "external" technologies (such as WLAN or IP) as described by "external" standards bodies (e.g. IEEE or IETF) are only referenced within the present document, wherever there is a need identified for the existence of such a reference.

The definition of the standard measurements is intended to result in comparability of measurement data produced in a multi-vendor network, for those measurement types that can be standardised across all vendors' implementations.

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 32.600: "Telecommunication management; Configuration Management (CM); Concept and high-level requirements".
- [2] 3GPP TR 32.841: "Telecommunication management; Study on Wireless Local Area Network (WLAN) management".
- [3] 3GPP TS 32.401: "Telecommunication management; Performance Management (PM); Concept and requirements".
- [4] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [5] IETF RFC 2863: "The Interfaces Group MIB".
- [6] IEEE 802.11™-2012: "IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [4] apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [4].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [4] 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 [4].

ACK	Acknowledgement
CSMA/CA	Carrier Sense Multiple Access/Collision Avoidance
CTS	Clear to Send
FCS	Frame Check Sum
MPDU	MAC Protocol Data Unit
PER	Packet Error Rate
RTS	Request to Send
TF	Transparent Forwarding

4 Measurement family

The measurement names defined in the present document are all beginning with a prefix containing the measurement family name (e.g. RRC.AttConnEstab.Cause). This family name identifies all measurements which relate to a given functionality and it may be used for measurement administration (see TS 32.401 [3]).

5 Measurements related to WLAN

5.1 Measurements related to WLAN AP data volume

5.1.1 Number of incoming unicast IP packets received at WLAN AP

- a) This measurement provides the number of incoming unicast IP packets received at the WLAN AP (see `ifHCInUcastPkts` in IF-MIB [5]).
- b) TF.
- c) This counter is defined in IF-MIB in IETF RFC 2863 [5].
- d) A single integer value.
- e) `IP.InUnicastPacketWlanAP`.
- f) `APFunction`.
- g) Valid for packet switched traffic.
- h) Combined.

5.1.2 Number of outgoing unicast IP packets transmitted by WLAN AP

- a) This measurement provides the number of outgoing unicast IP packets transmitted by the WLAN AP (see `ifHCOutUcastPkts` in IF-MIB in IETF RFC 2863 [5]).
- b) TF.
- c) This counter is defined in IF-MIB in IETF RFC 2863 [5].
- d) A single integer value.
- e) `IP.OutUnicastPacketWlanAP`.
- f) `APFunction`.

- g) Valid for packet switched traffic.
- h) Combined.

5.1.3 Number of incoming multicast IP packets received at WLAN AP

- a) This measurement provides the number of incoming multicast IP packets received at the WLAN AP (see `ifHCInMulticastPkts` in IF-MIB in IETF RFC 2863 [5]).
- b) TF.
- c) This counter is defined in IF-MIB in IETF RFC 2863 [5].
- d) A single integer value.
- e) `IP.InMulticastPacketWlanAP`.
- f) `APFunction`.
- g) Valid for packet switched traffic.
- h) Combined.

5.1.4 Number of outgoing multicast IP packets transmitted by WLAN AP

- a) This measurement provides the number of outgoing multicast IP packets transmitted by the WLAN AP (see `ifHCOutMulticastPkts` in IF-MIB in IETF RFC 2863 [5]).
- b) TF.
- c) This counter is defined in IF-MIB in IETF RFC 2863 [5].
- d) A single integer value.
- e) `IP.OutMulticastPacketWlanAP`.
- f) `APFunction`.
- g) Valid for packet switched traffic.
- h) Combined.

5.1.5 Number of incoming broadcast IP packets received at WLAN AP

- a) This measurement provides the number of incoming broadcast IP packets received at the WLAN AP (see `ifHCInBroadcastPkts` in IF-MIB in IETF RFC 2863 [5]).
- b) TF.
- c) This counter is defined in IF-MIB in IETF RFC 2863 [5].
- d) A single integer value.
- e) `IP.InBroadcastPacketWlanAP`.
- f) `APFunction`.
- g) Valid for packet switched traffic.
- h) Combined.

5.1.6 Number of outgoing broadcast IP packets transmitted by WLAN AP

- a) This measurement provides the number of outgoing broadcast IP packets transmitted by the WLAN AP (see `ifHCOutBroadcastPkts` in IF-MIB in IETF RFC 2863 [5]).
- b) TF.
- c) This counter is defined in IF-MIB in IETF RFC 2863 [5].
- d) A single integer value.
- e) `IP.OutBroadcastPacketWlanAP`.
- f) `APFunction`.
- g) Valid for packet switched traffic.
- h) Combined.

5.2 Measurements related to CSMA/CA protocol

5.2.1 Number of successful RTS responses

- a) This measurement provides the number of CTS (Clear to Send) received in response to an RTS (Request to Send) at the WLAN AP (see `dot11RTSSuccessCount` in IEEE802dot11-MIB in IEEE 802.11 [6]).
- b) TF.
- c) This counter is defined in IEEE802dot11-MIB in IEEE 802.11 [6].
- d) A single integer value.
- e) `MAC.SuccRtsWlanAP`.
- f) `APFunction`.
- g) Valid for packet switched traffic.
- h) Combined.

5.2.2 Number of failed RTS responses

- a) This measurement provides the number of CTS not received in response to an RTS at the WLAN AP (see `dot11RTSFailureCount` in IEEE802dot11-MIB in IEEE 802.11 [6]).
- b) TF.
- c) This counter is defined in IEEE802dot11-MIB in IEEE 802.11 [6].
- d) A single integer value.
- e) `MAC.FailRtsWlanAP`.
- f) `APFunction`.
- g) Valid for packet switched traffic.
- h) Combined.

5.2.3 Number of failed ACK responses

- a) This measurement provides the number of ACK (Acknowledgement) not received after transmitting the data at the WLAN AP (see `dot11ACKFailureCount` in IEEE802dot11-MIB in IEEE 802.11 [6]).

- b) TF.
- c) This counter is defined in IEEE802dot11-MIB in IEEE 802.11 [6].
- d) A single integer value.
- e) MAC.FailAckWlanAP.
- f) APFunction.
- g) Valid for packet switched traffic.
- h) Combined.

5.3 Measurements related to WLAN data packets

5.3.1 Number of successful MPDU receptions

- a) This measurement provides the number of incoming MPDU (MAC Protocol Data Unit) successfully received at the WLAN AP (see dot11ReceivedFragmentCount in IEEE802dot11-MIB in IEEE 802.11 [6]).
- b) TF.
- c) This counter is defined in IEEE802dot11-MIB in IEEE 802.11 [6].
- d) A single integer value.
- e) MAC.successMpduWlanAP.
- f) APFunction.
- g) Valid for packet switched traffic.
- h) Combined.

5.3.2 Number of failed MPDU receptions

- a) This measurement provides the number of MPDU received with FCS (Frame Check Sum) error at the WLAN AP (see dot11FCSErrorCount in IEEE802dot11-MIB in IEEE 802.11 [6]).
- b) TF.
- c) This counter is defined in IEEE802dot11-MIB in IEEE 802.11 [6].
- d) A single integer value.
- e) MAC.failedMpduWlanAP.
- f) APFunction.
- g) Valid for packet switched traffic.
- h) Combined.

5.4 Measurements related to station association

5.4.1 Number of associated stations

- a) This measurement provides the number of stations (see dot11AssociatedStationCount from IEEE802dot11-MIB in IEEE 802.11 [6]) that are associated with the WLAN AP.
- b) TF.

- c) This counter is defined in IEEE802dot11-MIB in IEEE 802.11 [6].
- d) A single integer value.
- e) NumberOfAssociatedStation.
- f) APFunction.
- g) Valid for packet switched traffic.
- h) Combined.

Annex A (informative): Use cases for performance measurements definition

A.1 Use case for WLAN AP data volume related measurements

WLAN AP data volume related measurements are used to measure data volume on the WLAN air interface, including incoming and outgoing data packets at IP layer. The measurements provide indication on how much UE traffic have been carried over the WLAN. If the data volume measurements are too low, it may indicate to operators that potential problems exist at a WLAN AP to prevent UEs from transmitting or receiving the data packets. If the data volume measurements are too high, it may signal the hot spot areas where additional WLAN APs may need to be deployed.

A.2 Use case for CSMA/CA protocol related measurements

CSMA/CA (Carrier sense multiple access with collision avoidance) is a technology used in WLAN AP to enable multiple UEs to access a common wireless carrier without conflict. CSMA/CA protocol related measurements count the number of successful RTS / CTS responses, failed RTS/CTS responses, and failed ACK responses that are tied closely to the WLAN performance. For example, higher percentage of RTS failure rate (i.e. the number of failed RTS response / (the number of failed RTS response + the number of successful RTS response) may indicate higher number of conflicts among AP and UEs that prevent the UE from responding with CTS. Failed ACK responses indicate that AP has received CTS to send the data packet, but the UE cannot receive data packet successfully. Therefore, higher percentage rate of ACK failure rate (i.e. the number of failed ACK responses / (the number of failed ACK responses + the number of successful ACK responses) may indicate higher number of data packets being corrupted or lost, due to reasons, such as interferences, signal fading, etc. So, higher percentage of RTS and ACK failure rates may indicate to operators why the users are suffering from poor WLAN performance.

A.3 Use case for WLAN data packets related measurements

WLAN data packets related measurements include the number of successful MPDU reception, and the number of failed MPDU reception that can be used to calculate WLAN Packet Error Rate (PER). WLAN PER may indicate to operators the performance of a WLAN AP. For example, higher WLAN packet error rate may imply poor WLAN performance.

A.4 Use case for station association measurements

A station is associated with a WLAN AP, when the station passed the authentication process, and is able to gain full access to the WLAN AP. Association allows the WLAN AP to record each station so that frames may be received from a station or sent to a station. The station association measurements enable operators to compute the mean and maximum numbers of associated station in a given interval that provide statistical information on how many station(s) are served by the WLAN AP.

Annex B (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2015-12	SP-70	SP-150689			Presented for approval	1.2.0	2.0.0
					Upgrade to Rel-13	2.0.0	13.0.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-03	SA#75					Promotion to Release 14 without technical change	14.0.0
2018-12	-	-	-	-	-	Update to Rel-15 version (MCC)	15.0.0
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0

History

Document history		
V16.0.0	August 2020	Publication