

# 3GPP TS 28.401 V0.2.0 (2013-06)

---

*Technical Specification*

**3rd Generation Partnership Project;  
Technical Specification Group Services and System Aspects;  
Telecommunication management;  
Performance Management (PM);  
Performance measurements  
for Core Network (CN) and non-3GPP access  
Interworking System  
(Release 12)**

---



---

Keywords

IWLAN, Performance measurement

**3GPP**

---

Postal address

---

3GPP support office address

---

650 Route des Lucioles - Sophia Antipolis  
Valbonne - FRANCE  
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

---

Internet

<http://www.3gpp.org>

---

**Copyright Notification**

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

© 2013, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TTA, TTC).  
All rights reserved.

UMTS™ is a Trade Mark of ETSI registered for the benefit of its members  
3GPP™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners  
LTE™ is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners  
GSM® and the GSM logo are registered and owned by the GSM Association

---

# Contents

Foreword .....	4
Introduction .....	4
1 Scope .....	6
2 References.....	6
3 Definitions and abbreviations .....	7
3.1 Definitions .....	7
3.2 Abbreviations.....	7
4 Measurements related to 3GPP AAA Server .....	7
4.1 Attached subscribers measurement .....	7
4.1.1 Mean number of attached subscribers .....	7
4.1.2 Maximum number of attached subscribers.....	7
5 Measurements related to WAG .....	8
6 Measurements related to PDG.....	8
6.1 Tunnel Establishment Measurements .....	8
6.1.1 Attempted Tunnel Establishment .....	8
6.1.2 Successful Tunnel Establishment .....	8
6.1.3 Failed Tunnel Establishment .....	9
6.2 AAA Authentication measurements.....	9
6.2.1 Attempted Authentication, per W-APN .....	9
6.2.2 Successful Authentication, per W-APN .....	10
6.2.3 Failed Authentication, per W-APN.....	10
<b>Annex A: Use cases for performance measurements definition.....</b>	<b>11</b>
A.1 Use case for attached subscribers measurement .....	11
A.2 Use case for tunnel establishment measurements .....	11
A.3 Use case for AAA authentication measurements.....	11
<b>Annex B: Change history.....</b>	<b>12</b>

---

## Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> 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	Telecommunication management; Performance Management (PM); Performance measurements Evolved Universal Terrestrial Radio Access Network (E-UTRAN)
32.426	Telecommunication management; Performance Management (PM); Performance measurements Evolved Packet Core (EPC) network
32.452	Performance Management (PM); Performance measurements Home Node B Subsystem (HNS)
32.453	Performance Management (PM); Performance measurements Home enhanced Node B Subsystem (HeNS)
<b>28.401</b>	<b>Performance Management (PM); Performance measurements for Core Network (CN) and non-3GPP access Interworking System</b>
28.402	Performance Management (PM); Performance measurements for Evolved Packet Core (EPC) and non-3GPP access Interworking System

The present document is part of a set of specifications, which describe the requirements and information model necessary for the standardised Operation, Administration and Maintenance (OA&M) of the Core Network (CN) and Wireless Local Area Network (WLAN) Interworking System.

During the lifetime of interworking network, its logical and physical configuration will undergo changes of varying degrees and frequencies in order to optimise the utilisation of the network resources. These changes will be executed through network configuration management activities and/or network engineering, see 3GPP TS 32.600 [1].

Many of the activities involved in the daily operation and future network planning of interworking require data on which to base decisions. This data refers to the load carried by the network and the grade of service offered. In order to produce this data performance measurements are executed 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.

Annex B of TS 32.404 [2] helps in the definition of new performance measurements that can be submitted to 3GPP for potential adoption and inclusion in the present document. Annex B of TS 32.404 discusses a top-down performance measurement definition methodology that focuses on how the end-user of performance measurements can use the measurements.

The use cases should be provided at Annex A as a justification for performance data in this specification.

---

# 1 Scope

The present document describes the measurements for CN and non-3GPP interworking system.

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

Measurements related to "external" technologies (such as ATM or IP) as described by "external" standards bodies (e.g. ITU-T or IETF) shall only be referenced within this specification, 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.

The structure of the present document is as follows:

- Header 1: Network Element (e.g. measurements related to WAG, PDG and so on);
- Header 2: Measurement function (e.g. FFS);
- Header 3: Measurements.

---

# 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 TS 32.404: "Performance Management (PM); Performance measurements - Definitions and template".
- [3] 3GPP TS 32.401: "Telecommunication management; Performance Management (PM); Concept and requirements".
- [4] 3GPP TS 23.234: "3GPP system to Wireless Local Area Network (WLAN) interworking; System description".

---

## 3 Definitions and abbreviations

### 3.1 Definitions

The measurement names defined in the present document are all beginning with a prefix containing the measurement family name. 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]).

The list of families currently used in the present document is as follows:

- SUB (measurements related to Subscriber Management)
- TUN (measurements related to Tunnel Establishment Management)
- AAA (measurements related to AAA Authentication)

### 3.2 Abbreviations

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

AAA	Access, Authentication and Authorisation
WAG	WLAN Access Gateway
PDG	Packet Data Gateway

---

## 4 Measurements related to 3GPP AAA Server

### 4.1 Attached subscribers measurement

#### 4.1.1 Mean number of attached subscribers

- a) This measurement provides the mean number of attached state subscribers.
- b) SI.
- c) This measurement is obtained by sampling at a pre-defined interval the number of attached subscribers in AAA server and then taking the arithmetic mean.
- d) A single integer value.
- e) SUB.AttachedSubNbrMean
- f) 3GPPAAAServerFunction, 3GPPAAAProxyFunction
- g) Valid for packet switching.
- h) Combined

#### 4.1.2 Maximum number of attached subscribers

- a) This measurement provides the maximum number of attached state subscribers.
- b) SI.
- c) This measurement is obtained by sampling at a pre-defined interval the number of attached subscribers in AAA server and then taking the maximum.

- d) A single integer value.
- e) SUB.AttachedSubNbrMax
- f) 3GPPAAAServerFunction, 3GPPAAAProxyFunction
- g) Valid for packet switching.
- h) Combined

---

## 5 Measurements related to WAG

---

## 6 Measurements related to PDG

---

### 6.1 Tunnel Establishment Measurements

The measurements types defined in subclauses 6.x are subject to the "2 out of 3 approach".

#### 6.1.1 Attempted Tunnel Establishment

- a) This measurement provides the number of attempted tunnel establishment
- b) CC
- c) Receipt of tunnel establishment request message from UE to PDG
- d) A single integer value
- e) TUN.TunEstAtt
- f) PdgFunction
- g) Valid for packet switched traffic.
- h) UMTS

#### 6.1.2 Successful Tunnel Establishment

- a) This measurement provides the number of successful tunnel establishment
- b) CC
- c) Transmission of tunnel establishment response message from PDG to UE
- d) A single integer value.
- e) TUN.TunEstSucc
- f) PdgFunction



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

### 6.1.3 Failed Tunnel Establishment

- a) This measurement provides the number of failed tunnel establishment
- b) CC
- c) Transmission of tunnel establishment reject message from PDG to UE
- d) A single integer value.
- e) TUN.TunEstFail
- f) PdgFunction
- g) Valid for packet switched traffic.
- h) UMTS

## 6.2 AAA Authentication measurements

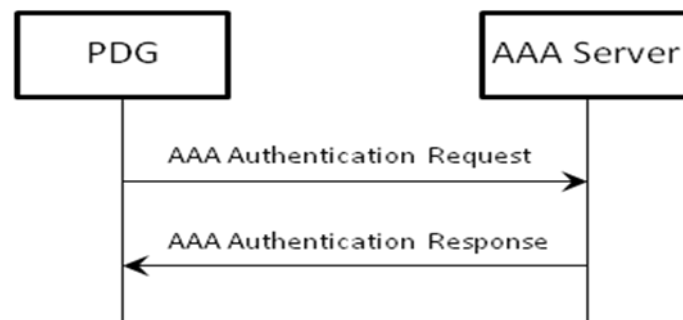
The performance counters presented in this subclause are mainly intended to:

- monitor the AAA server performance;
- monitor the network connectivity.

These counters are associated to the AAA server, which is playing a important role in I-WLAN environment, and is defined in TS 23.234 [4].

The measurements types defined in subclauses 6.x are subject to the "2 out of 3 approach".

The figure below presents the message sequence during an AAA authentication procedure initiated by the PDG.



**Figure: AAA authentication procedure initiated by PDG**

### 6.2.1 Attempted Authentication, per W-APN

- a) This measurement provides the number of attempted authentication procedures per W-APN.
- b) CC
- c) Transmission by the PDG of an AAA authentication request message to the AAA server. W-APN being requested by the WLAN UE is contained in the message.
- d) A single integer value.

- e) AAA.AttAuthQuery.*WApn*  
where *WApn* is used to identify a specific IP network and a point of interconnection to that network (Packet Data Gateway)
- f) PdgFunction
- g) Valid for packet switched traffic.
- h) UMTS

### 6.2.2 Successful Authentication, per W-APN

- a) This measurement provides the number of successful authentication procedures per W-APN.
- b) CC
- c) Receipt by the PDG of an AAA successful authentication response message from the AAA server. W-APN being requested by the WLAN UE is contained in the message.
- d) A single integer value.
- e) AAA.SuccAuthResp.*WApn*  
where *WApn* is used to identify a specific IP network and a point of interconnection to that network (Packet Data Gateway).
- f) PdgFunction
- g) Valid for packet switched traffic.
- h) UMTS

### 6.2.3 Failed Authentication, per W-APN

- a) This measurement provides the number of failed authentication procedures per W-APN.
- b) CC
- c) Receipt by the PDG of an AAA authentication reject message from the AAA server. W-APN being requested by the WLAN UE is contained in the message.
- d) A single integer value.
- e) AAA.SuccAuthResp.*WApn*  
where *WApn* is used to identify a specific IP network and a point of interconnection to that network (Packet Data Gateway).
- f) PdgFunction
- g) Valid for packet switched traffic.
- h) UMTS

---

## Annex A: Use cases for performance measurements definition

The present annex provides the concrete use cases for the interworking system performance measurements defined in clause 4.

---

### A.1 Use case for attached subscribers measurement

3GPP WLAN attach status indicates whether the WLAN UE is now being served by the 3GPP-WLAN Interworking System. A WLAN UE is "WLAN-attached" after successful authentication and WLAN Access Authorization. The WLAN-attach status is maintained by the 3GPP AAA Server. In the attached state, the UE can initiate packages and receive services via IWLAN system. Operators shall have the knowledge of the number of attached subscribers in AAA server or AAA proxy server to evaluate the capacity status of servers.

---

### A.2 Use case for tunnel establishment measurements

It's required to setup secure tunnels between WLAN UE and remote tunnel endpoint once UE attaches to IWLAN system. The tunnel shall reside between the WLAN UE and the PDG. In order to guarantee the user experiences, the tunnel should be established before the data is transmitted. During the period of tunnel establishment, PDG may reject the tunnel establishment due to WLAN QoS profile request or policy enforcement in AAA servers. Those rejections would impact subsequent traffic transmission and user experiences. It's desirable to operators to get the indications before massive rejection happened.

---

### A.3 Use case for AAA authentication measurements

WLAN Access Authorization is used in 3GPP AAA Server to verify whether WLAN Access should be allowed to a subscriber and deciding what access rules/policy should be applied to a subscriber. It is the stage after access authentication, but before service authorisation and WLAN UE's local IP address allocation. If the Authentication success rate is very low, user experience will be affected, such as user will wait for a long time or even be rejected to access the network. Therefore it is important to define attempted and successful authentication information performance measurements to calculate authentication information retrieval success rate. The failed authentication ratio could be calculated according to the attempted authentication and successful authentication. It's useful to facilitate trouble shooting.

---

## Annex B: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Apr 2013			--	--	Initial version for TS skeleton	0.0.0	0.0.1
May 2013					Update the draft with the comments at the meeting and email approval	0.0.1	0.1.0
Jun 2013					Add the performance measurement to SUB, TUN and AAA	0.1.0	0.2.0