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Contents

Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

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x the first digit:

1 presented to TSG for information;

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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

WLAN offload is becoming a compelling solution for operators to cope with rapid growth of mobile data traffic without the need of network upgrades or expansions. To enable WLAN playing such a role to complement the cellular technology, the behaviour of WLAN has to be known by the 3GPP OAM system. This document is intended to enable a 3GPP OAM system to monitor WLAN performance measurements and alarms that are essential to evaluate the performance of WLAN offloading. The WLAN performance data can also be used in network planning.

1. Scope

The present document describes the study on WLAN management that focuses on WLAN performance monitoring and alarm reporting. The WLAN performance data and alarms are sent to the NM via the Type-2 interface. No impact to the Type-1 interface of WLAN NE and the WLAN MIB specified by other SDO is expected.

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] IEEE Std "Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications"

[2] RFC 2863, "The Interfaces Group MIB"

[3] 3GPP TR 21.905, "Vocabulary for 3GPP Specifications"

3. Abbreviations

3.1 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [3] 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 [3].

AP	Access Point
MIB	Management Information Base
SDO	Standards Development Organization

4 Concept and architecture implied

4.1 General concept

WLAN is becoming an essential technology to complement 3GPP RAN, as operators are deploying huge number of WLAN nodes to mitigate the traffic congestion caused by the surge of mobile data traffic. As the result, performance data of eNB and WLAN AP are important measurements for monitoring the performance of WLAN offloading. Since mobile data traffic can fluctuate very rapidly and dynamically, the performance measurements of both eNB/NB and WLAN APs that are overlaid by the eNB/NB need to be collected, and then correlated on a regular basis, in order to understand the WLAN offloading performance, and to identify any potential issues that may degrade the offloading performance.

For interworking with 3GPP networks, WLAN alarm reporting is also needed.

4.2 Architectures

This section describes 3 scenarios of WLAN management architectures. Figure 4.2-1 shows the architecture for PM data correlation to be done at NM.

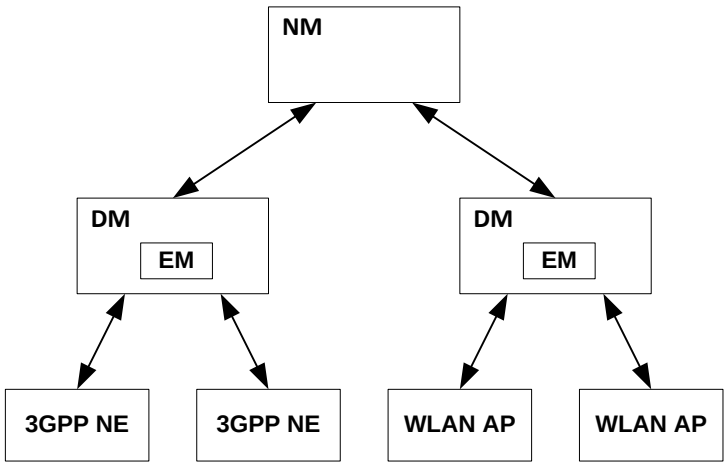

Figure 4.2-1: PM data correlation at NM

Figure 4.2-2 shows the architecture for PM data correlation to be done at DM.

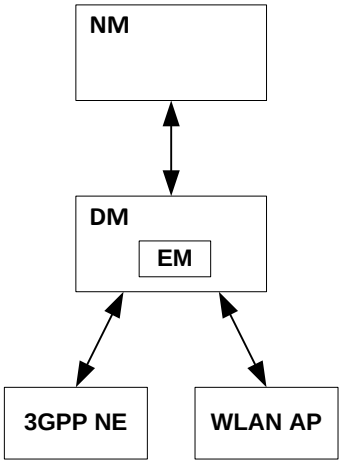

Figure 4.2-2: PM data correlation at DM

Figure 4.2-3 shows the architecture for PM data correlation to be done via peer DM.

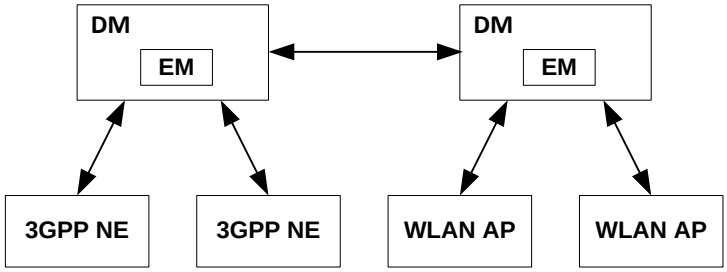

Figure 4.2-3: PM data correlation via peer DM

4.3 Sources of PM data and Alarm data

Since type-1 interface to WLAN AP is not standardized in 3GPP, standards from other SDO are required to support Type-2 PM and Alarms for WLAN management. The WLAN Management is to be defines based on IEEE and IETF WLAN performance measurements.

For IEEE WLAN PM and FM, the relevant SNMP MIBs are:

- IEEE 802.11 "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications" [1]
- RFC 2863, "The Interfaces Group MIB" [2]

The IEEE 802.11 MIB, as defined in IEEE 802.11 [1], includes for example `dot11QosCountersTable`, which provides counters to measure the performance of a WLAN AP.

4.4 3GPP – WLAN Mapping Function

Figure 4.4-1 depicts the mapping function that is to map the network management data exchanged via the Type-2 interface to the network management data of WLAN AP.

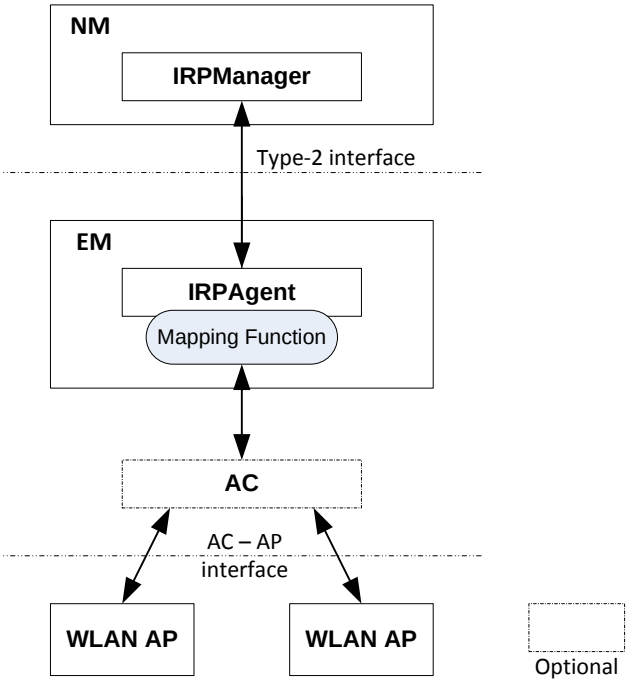

Figure 4.4-1: 3GPP – WLAN Mapping Function

IRPManager can manage the WLAN AP by sending the management data to IRPAgent over the Type-2 interface. IRPAgent, then interact with the mapping function that will map the management data into the format that can be sent to WLAN AP directly or via AC (Access Controller).

WLAN AP can report the management data to the mapping function directly, or via AC. The mapping function will map the management data into the format that IRPAgent can send to IRPManager via the Type-2 interface.

Note: It should be noticed that WLAN PM counters as defined in IEEE 802.11 or IETF are not able to support the cumulative incremental method that NE may use to collect the PM measurements. It is the responsibility of EM or Mapping Function to take care of this issue.

Editor's note:

1) The details of the mapping function are FFS.

2) The interface and entities below EM are out of the scope of the standard.

5 Use cases

5.1 WLAN performance monitoring

To enable WLAN playing a role as a complement to cellular technology, the performance of WLAN needs to be known by cellular operators. WLAN performance data is also essential to monitor the quality of service a subscriber may receive. The WLAN performance may be monitored by following parameters:

- Data volume
- The number of associated UE

Data volume

It measures data volume on MAC layer or IP layer level per elapsed time unit that provides an indication of loading and activity in the WLAN AP.

The following lists the possible PM counters that are to be mapped to the network management data, and then delivered to the IRPManager via the Itf-N interface:

- ifInOctets, and ifOutOctets in IF-MIB (IETF RFC 2863)

The number of associated UE

It is also of interest to determine how many users are associated with a given WLAN AP, as it indicates the number of UE that are connected to a WLAN AP. If lower packet throughput is generated from large number of associated UE, it may be the indication to poor WLAN performance.

The following lists the possible PM counter that is to be mapped to the network management data, and then delivered to the IRPManager via the Itf-N interface:

- dot11AssociatedStationCount in `IEEE802dot11-MIB` (IEEE 802.11)

5.2 WLAN alarm reporting

Table 5.2-1 WLAN Alarm Reporting

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal (*)	WLAN AP alarm reporting	
Actors and Roles (*)	IRPManager as user	
Telecom resources	The WLAN AP, IRPAgent, and IRPManager.	
Assumptions	IRPAgent is able to receive or get WLAN AP alarms.	
Pre conditions	The WLAN AP is up and running.	
Begins when	A fault in a WLAN AP causes the WLAN air interface link to go down.	
Step 1 (*) (M)	IRPAgent receives an alarm from WLAN AP as the result of state change (e.g. ifOperStatus (RFC 2863) is transitioned from up(1) to down (2))	
Step 2 (*) (M)	IRPAgent maps this alarm received from WLAN AP to a state change notification over Itf-N.	
Step 3 (*) (M)	IRPAgent sends the state change notification to the IRPManager over Itf-N.	
Ends when (*)	The IRPManager receives the state change notification.	
Exceptions	FFS.	
Post Conditions		
Traceability (*)		

Note: Whether the WLAN AP state change notification is an alarm notification is subject to FFS.

5.3 WLAN alarm retrieval

Table 5.2-2 WLAN Alarm Retrieval

Use Case Stage	Evolution / Specification	<<Uses>> Related use
Goal (*)	WLAN AP alarm retrieval	
Actors and Roles (*)	IRPManager as user	
Telecom resources	The WLAN AP, IRPAgent, and IRPManager.	
Assumptions	The IRPAgent is able to retrieve WLAN AP alarms.	
Pre conditions	The WLAN AP is up and running.	
Begins when	The IRPManager is ready to retrieve the alarm information of a WLAN AP	
Step 1 (*) (M)	The IRPManager requests the WLAN AP alarm information from the IRPAgent	
Step 2 (*) (M)	The IRPAgent returns the WLAN AP alarm information to the IRPManager	
Ends when (*)	The IRPManager receives the WLAN AP alarm information.	
Exceptions	FFS.	
Post Conditions		
Traceability (*)		

6 Potential Requirements

The IRPAgent should provide the capability to the IRPManager to retrieve the performance measurements using an existing Interface IRP, such as File Transfer IRP.

The IRPAgent should support the capability of reporting alarms of the WLAN AP to the IRPManager by using an existing Interface IRP.

Editor's note: Which IRP to be used is FFS.

7 Conclusion

Annex A:
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2012-08					First version with document structure created.		0.0.0
2012-09					Post-SA5#84 Berlin changes. Based on TR skeleton draft S5-122177 and pCR S5-122193,	0.0.0	0.1.0
2012-10					Post-SA5#85 Kyoto changes. Based on pCR S5-122535	0.1.0	0.2.0
2013-02					Post-SA5#87 Malta changes. Based on pCR S5-130305 and S5-130318	0.2.0	0.3.0
2013-05					Post-SA5#88 Qingdao changes. Based on pCR S5-130552, S5-130741, and S5-130793	0.3.0	0.4.0
2013-06					Post-SA5#89 Sophia Antipolis changes. Based on pCR S5-131026, and S5-131027	0.4.0	0.5.0
2013-09					Post-SA5#90 Valencia changes. Based on pCR S5-131420, and S5-131421	0.5.0	0.6.0
2013-09	SA#61	SP-130453			Presented for information	0.6.0	1.0.0