ETSI TS 132 130 V13.0.0 (2016-02)

TECHNICAL SPECIFICATION

Universal Mobile Telecommunications System (UMTS);
LTE;
Telecommunication management;
Network sharing;
Concepts and requirements
(3GPP TS 32.130 version 13.0.0 Release 13)

Reference
RTS/TSGS-0532130vd00

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 only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

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
http://portal.etsi.org/tb/status/status.asp

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

Intellectual Property Rights

IPRs essential or potentially essential to the present document 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.

Foreword

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, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 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

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

Network sharing is emerging as a mechanism for operators to substantially and sustainably improve network costs and to efficiently utilize network capacity. The traditional model of single ownership of all network layers and elements is being challenged and more and more operators are adopting network sharing as a means of cutting the heavy costs involved in initial roll-out, capital expenditure (CAPEX) and operational expenditure (OPEX).

In general, an increasing number of operators are sharing their mobile networks. Main arguments presented are:

- Increased rollout speed.

- Quickly expanding coverage to meet customer demand for wider coverage.

- Sharing low traffic areas.

- Sharing high license burdens.

- Lower CAPEX and OPEX.

Network sharing has some major implications on the operations of the network. Alignment on operational priorities, common network planning/evolution strategy, sharing end user data/subscriber data, sharing performance data, alarms etc. in the shared network need to be considered carefully. Privacy, security and competitive information are also important for the operations of a shared network.

1 Scope

The present document describes concepts and high-level requirements for the Operations, Administration, Maintenance and Provisioning (OAM&P) of network sharing.

Network sharing scenarios considered in the present document are Multiple Operator Core Network (MOCN) and Gateway Core Network (GWCN) for GERAN, UTRAN and E-UTRAN, as defined in TS 23.251 [7]).

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 32.101: "Telecommunication management; Principles and high level requirements".

[3]   3GPP TS 32.102: "Telecommunication management; Architecture".

[4]   3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[5]   3GPP TS 23.251: "Network sharing; Architecture and functional description".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 32.101 [2], TS 32.102 [3] and 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 TS 32.101 [2], TS 32.102 [3] and TR 21.905 [1], in that order.

Organizational roles:

Master Operator (MOP): In Radio Access Network (RAN) and/or Core Network (CN) sharing scenarios, deployment and daily operation of shared network elements are entrusted to a single Actor, called the Master Operator. The Master Operator provides network and OAM&P services to other Operators, called Participating Operators (POPs). The Master Operator is the only one to have a direct OAM&P connection from its Domain Manager (DM) to the shared network elements.

Participating Operator (POP): Participating Operators are service providers who share, alongside other Participating Operators, the network (RAN and/or CN) facilities provided by the Master Operator. According to TS 36.300 [4] up to 6 operators can share a RAN.

NOTE: In a RAN/CN sharing scenario where Company A and Company B are POPs, MOP represents a role which can be played by either:

- Company A or Company B: in that case, Company A or Company B plays both roles, i.e. is the MOP and one of the POPs simultaneously, or

- A joint-venture between Company A and Company B, or

- A third-party entity: in this context, third party is referring to a wholesale mobile connectivity provider.

In the two latter cases, companies A and B rely on another company to play the role of MOP. This company cannot play the role of POP.

Management systems:

Master Operator Network Manager (MOP-NM): Network Manager enabling the Master Operator to manage the shared RAN and/or shared CN.

Master Operator Shared CN DM (MOP–SC-DM): Domain Manager enabling the Master Operator to manage the Shared CN.

Master Operator Shared RAN DM (MOP–SR-DM): Domain Manager enabling the MOP to manage the Shared RAN.

Participating Operator CN DM (POP-CORE-DM): Domain Manager enabling a Participating Operator to manage its own (not shared) Core Network.

Participating Operator Network Manager (POP-NM): Network Manager enabling a Participating Operator to manage its own (not shared) network and its portion of the shared network.

Participating Operator RAN DM (POP-RAN-DM): Domain Manager enabling a Participating Operator to manage its own (not shared) RAN.

Managed resources in a shared Radio Access Network (RAN) environment:

Shared RAN (S-RAN): A set of Radio Access Network elements shared among Participating Operators.

Managed resources in a shared Core Network (CN) environment:

Shared CN (S-CORE): A set of Core Network elements shared among Participating Operators. It may or may not include all core network elements. For example, the Participating Operators may share only the MMEs while having independent S/P GWs.

3.2   Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

DM	Domain Manager
GWCN	Gateway Core Network
MDT	Minimization of Drive Tests
MOCN	Multiple Operator Core Network
MOP	Master Operator
MOP-NM	Master Operator Network Manager
MOP–SC-DM	Master Operator Shared CN DM
MOP–SR-DM	Master Operator Shared RAN DM
NGCOR	Next Generation Converged Operations Requirements
OAM&P	Operations, Administration, Maintenance and Provisioning
POP	Participating Operator

POP-CORE-DM Participating Operator CN DM
POP-NM   Participating Operator Network Manager
POP-RAN-DM   Participating Operator RAN DM
SON   Self-Organizing Networks
S-CORE   Shared CN
S-RAN   Shared RAN

4 Concepts and background

4.1 RAN sharing scenarios

Various network sharing scenarios exist, amongst which one category is RAN sharing which can be divided into the following (non exhaustive) list of sub-categories:

- Passive RAN sharing, also known as infrastructure sharing (including site sharing).

- Active RAN sharing, where active network elements of the RAN are shared:

  - RAN-only sharing (MOCN; see TS 23.251 [5]), i.e. BTSs / BSCs (respectively NodeBs / RNCs and eNodeBs) in a 2G Radio Access Network (respectively a 3G Radio Access Network and an E-UTRA network);

  - Gateway Core Network (GWCN; see TS 23.251 [5]), in which not only the Radio Access Network elements are shared but also part or all of the Core Network elements (there is no passive core network sharing).

In MOCN, POPs have a common S-RAN, have their individual Core Network and their own PLMN code(s), and use the same frequency on the S-RAN.
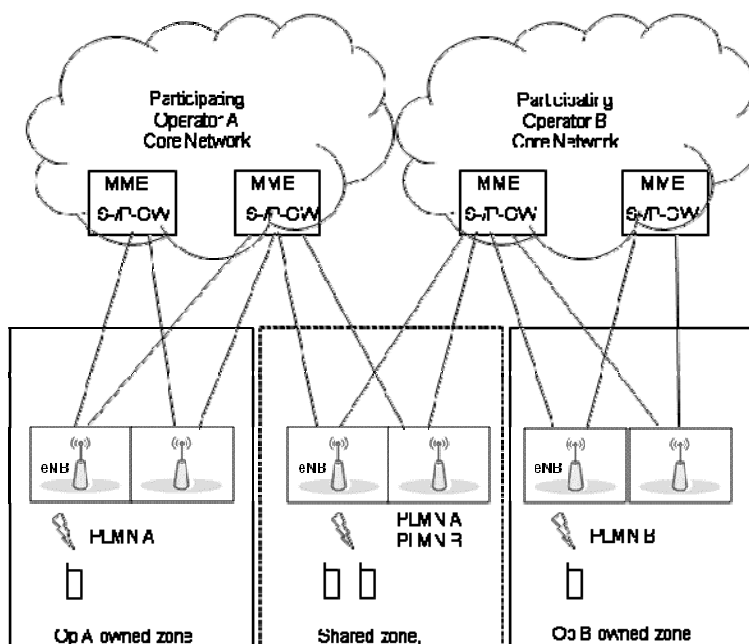

Figure 4.1-1: Multiple Operator Core Network (MOCN)

In GWCN, besides sharing Radio Access Network nodes, the POPs also share Core Network nodes (see TS 23.251 [5] – clause 4.1).
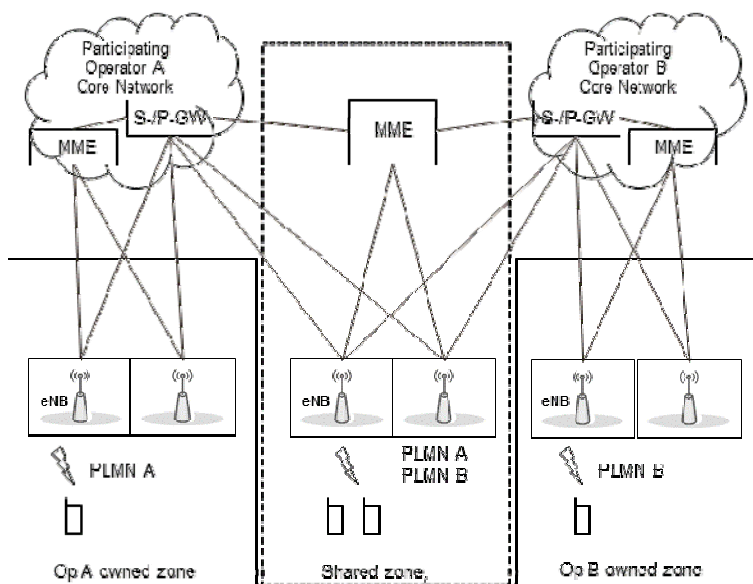
Figure 4.1-2: GateWay Core Network (GWCN)

4.2 Management architecture

The management architecture for MOCN is depicted in figure 4.2-1. It is compliant with 3GPP management reference model (TS 32.101 [2]).
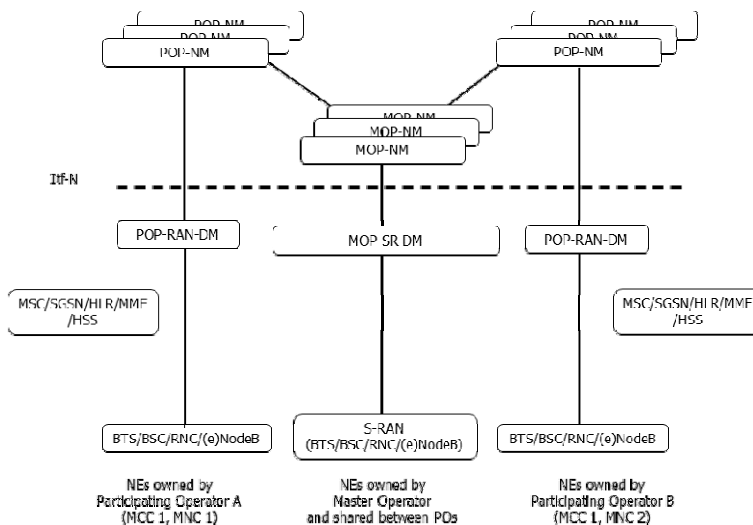

Figure 4.2-1: Management architecture for MOCN

In the MOCN scenario, all cells of the S-RAN are shared between POPs.

The management architecture for GWCN is depicted in figure 4.2-2. It is compliant with 3GPP management reference model (TS 32.101 [2]).
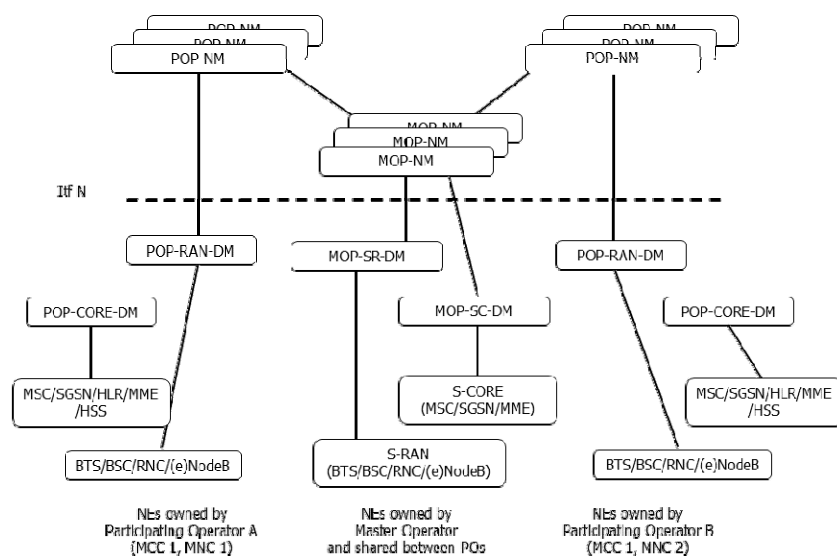
Figure 4.2-2: Management architecture for GWCN

5 Business level requirements

5.1 Requirements

5.1.1 Requirements for the OAM&P of shared RAN

REQ-NS_GEN-CON-1 The **MOP–SR-DM** shall support a capability allowing the **MOP-NM** to manage **S-RAN** of any of the following radio access technologies:

  i/ GERAN;

  ii/ UTRAN;

  iii/ E-UTRAN.

REQ-NS_GEN-CON-2 The **MOP–SR-DM** shall support a capability allowing the **MOP-NM** to manage **S-RAN** according to any of the following scenarios:

  i/ Multi-Operator Core Network

  ii/ Gateway Core Network.

REQ-NS_GEN-CON-3 The **MOP–SR-DM** shall support a capability allowing the **MOP-NM** to know which POPs the shared resources belong to.

REQ-NS_GEN-CON-4 The **MOP–SR-DM** shall support a capability allowing the **MOP-NM** to configure which POPs share each cell.

REQ-NS_GEN-CON-5 Any POP shall be able to activate a signaling-based trace / MDT session on its subscribers, whether they are attached to the POP own RAN or to the **S-RAN**, provided:

  a/ this is compliant with the RAN sharing contract; and

  b/ user consent for participation in MDT is respected.

REQ-NS_GEN-CON-6 The MOP shall be able, on behalf of any POP, to activate an area-based trace / MDT session, on the portion of the **S-RAN** that the POP shares and on the POP subscribers only, from the MOP RAN DM or MOP NM, provided

  a/ only the POP related subscriber data are collected;

b/ this is compliant with the RAN sharing contract; and

c/ user consent for participation in MDT is respected.

REQ-NS_GEN-CON-7 The MOP shall be able, on behalf of multiple POPs, to activate an area-based trace / MDT session, on the portion of the **S-RAN** that each POP shares and on each POP subscribers only, from the MOP RAN DM or MOP NM, provided:

a/ each POP has access only to its subscriber data (i.e. not to other POPs' subscriber data);

b/ this is compliant with the RAN sharing contract; and

c/ user consent for participation in MDT is respected.

5.1.2 Requirements for the OA&M of shared core network elements

REQ-NS_GEN-CON-8 In the GWCN scenario, the MOP shall be able to manage **S-CORE**.

REQ-NS_GEN-CON-9 The MOP shall be able to know which POPs the shared core network elements belong to.

REQ-NS_GEN-CON-10 The MOP shall be able to configure which POPs share each core network element.

5.2 Actor roles

MOP-SR-DM: An entity performing an IRPAgent role in MOCN and in GWCN.

MOP-SC-DM: An entity performing an IRPAgent role in GWCN.

MOP-NM: An entity performing the IRPManager role in MOCN and in GWCN.

5.3 Telecommunications resources

For MOCN and GWCN, the managed GERAN, UTRAN, E-UTRAN network elements are viewed as relevant telecommunications resources in the present document.

For GWCN, MSC, SGSN and MME are viewed as relevant telecommunications resources in the present document.

5.4 High-level use cases

5.4.1 Fully pooled radio resources between two POPs

In this use case, cells are shared between POP A and POP B. As agreed by MOP and POPs in their RAN sharing agreement:

- Radio resources of the **S-RAN** are fully pooled between POP A and POP B; UEs from POP A and POP B are served in the **S-RAN** in a first come first served mode;

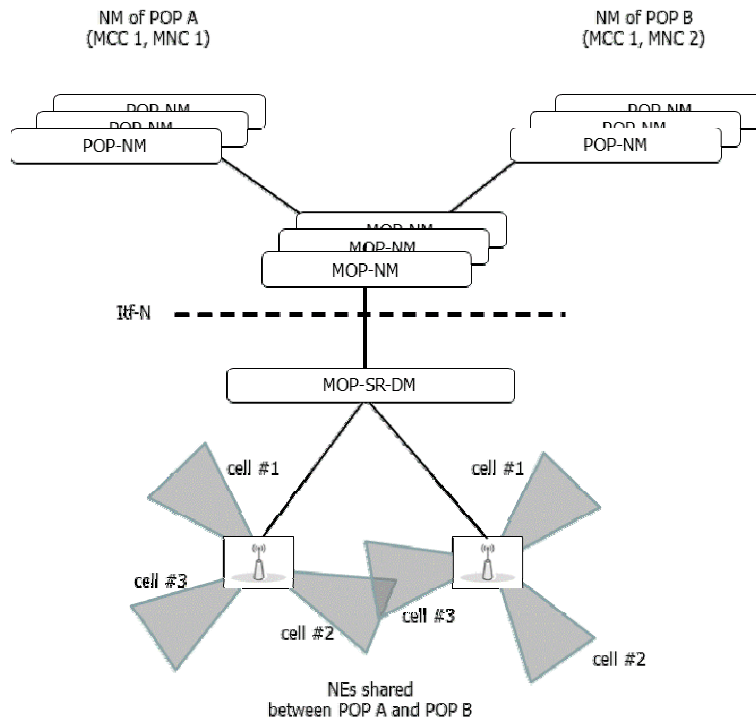- MOP is responsible for configuring the **S-RAN** accordingly.

Figure 5.4.1-1: Fully pooled radio resources between two POPs

5.4.2 Alarm raised on a shared cell (MOCN scenario)

In this use case, an alarm is raised on cell #1 of a shared (e)NodeB. According to the RAN sharing agreement, the two POPs A and B are informed by the MOP of the occurrence of this new alarm, as well as of the alarm clearance by the MOP.
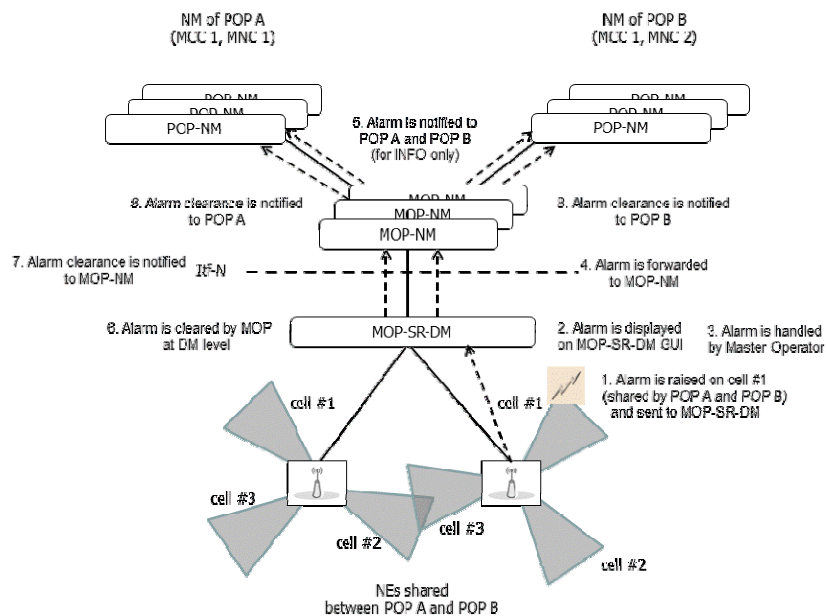

Figure 5.4.2-1. Handling of an alarm raised on a shared cell (MOCN)

5.4.3   Single DM for managing S-RAN and POP own RAN

In this use case, Operator A is a POP and manages its own (non-shared) NEs from its POP-RAN-DM while Operator B is both MOP and POP and manages **S-RAN** and its own (non-shared) NEs from a single DM.

Operator B has several possibilities:

Example #1: configure, NE per NE, which POPs share the cells that it manages; or

Example #2: define two separate groups of BTSs / (e)NodeBs:

-    one for the **S-RAN** NEs – it shall then configure which POPs share the cells of this group of BTSs / (e)NodeBs; and
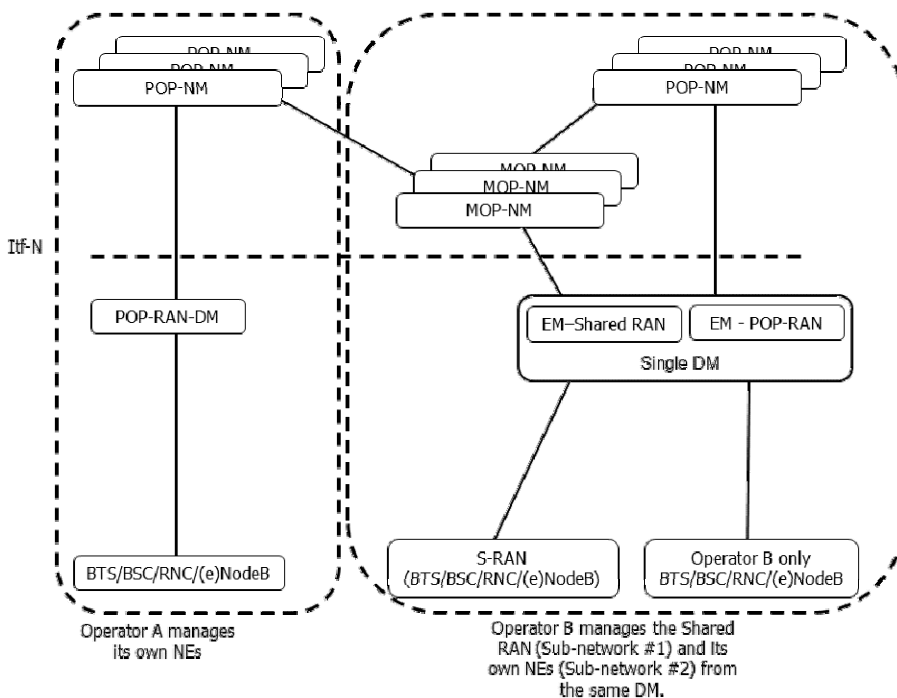
-    one for its own (non-shared) RAN NEs.

Figure 5.4.3-1: Single DM for managing both S-RAN and own RAN

6 Specification level requirements

6.1 Requirements

REQ-NS_GEN-FUN-1 The IRPAgent shall support a capability allowing the IRPManager to configure which POPs share each cell.

REQ-NS_GEN-FUN-2 The IRPAgent shall support a capability allowing the IRPManager to know which POPs share each cell.

REQ-NS_GEN-FUN-3 In GWCN, the IRPAgent shall support a capability allowing the IRPManager to configure which POPs share each core network element.

REQ-NS_GEN-FUN-4 In GWCN, the IRPAgent shall support a capability allowing the IRPManager to know which POPs share each core network element.

6.2 Actor roles

See clause 5.2.

6.3 Telecommunications resources

See clause 5.3.

6.4 Use cases

See clause 5.4.

Annex A (informative): Network sharing agreement

Prior to any network sharing deployment, the MOP and the POPs have to agree on legal, financial, technical and operational aspects. Among operational aspects, the network sharing agreement captures the following (non-exhaustive list):

- Organizations involved (i.e. Operators) and their roles in the network sharing deployment.

- Exhaustive list of shared and unshared resources in the shared network.

- Rights attached to each role (e.g. rights to configure network resources, rights to receive alarms, etc.).

- Duties attached to each role (e.g. obligation for the MOP to provide POPs with monthly KPIs, etc.).

- Delegations (if any) given by any organization to another organization.

- Service Level Agreements (SLAs).

Annex B (informative):
Change history

<table>
<tr><td colspan="8" align="center">Change history</td><td></td><td></td></tr>
<tr><td>Date</td><td>TSG #</td><td>TSG Doc.</td><td>CR</td><td>Rev</td><td>Subject/Comment</td><td>Old</td><td>New</td></tr>
<tr><td>2014-12</td><td>SA#66</td><td>SP-140795</td><td></td><td></td><td>Presented for approval</td><td>1.2.0</td><td>2.0.0</td></tr>
<tr><td>2014-12</td><td></td><td></td><td></td><td></td><td>Version after approval</td><td>2.0.0</td><td>12.0.0</td></tr>
<tr><td>2016-01</td><td>-</td><td>-</td><td>-</td><td>-</td><td>Update to Rel-13 version (MCC)</td><td>12.0.0</td><td>13.0.0</td></tr>
</table>

History

Document history		
V13.0.0	February 2016	Publication