3GPP TR 32.806 V7.0.0 (2006-06)

Technical Report

3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Telecommunication management; Application guide for use of Integration Reference Points (IRPs) on Peer-to-Peer (P2P) Interface (Release 7)

Keywords
management, IRP

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Foreword

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Introduction

This Technical Report introduces to Telecommunication Management (TM) a peer-to-peer architecture i.e. horizontal interfaces between Operation Support Systems (OSS) to enable the exchange of information that allows existing OSS functionality to be used more effectively.

1 Scope

The present document shows how P2P horizontal interfaces can be added to the existing Telecommunication Management (TM) architecture and how existing Integration Reference Points (IRPs) can be applied to this architecture.

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

[2] 3GPP TS 32.150: "Telecommunication management; Integration Reference Point (IRP) Concept and definitions".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 32.101 [1], TS 32.102 [2] and the following apply:

Domain Management Function (DM-F): sub-network management functions extended with functionality to manage the boundaries of sub-network with other sub-networks which are themselves managed by Domain Management Functions. This model enables additional functions on the Sub-Network and Network Management levels.

Domain Manager (DM): provides element management functions and domain management functions for a sub-network. Inter-working domain managers provide multi vendor and multi technology network management functions.

Sub-Network Management Functions (SNM-F): functions related to a network model for a set of Network Elements (NEs) constituting a clearly defined sub-network, which may include relations between the NEs. This model enables additional functions on the sub-network level (typically in the areas of network topology presentation, alarm correlation, service impact analysis and circuit provisioning). See 3GPP TS 32.101 [1].

Sub-Network Manager (SNM): provides a package of end-user functions for management of a set of NEs constituting a sub-network. These functions may include management of relations between NEs.

example: text used to clarify abstract rules by applying them literally.

3.2 Abbreviations

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

CO-OP	Co-Operative, referring to Domain Managers Co-operating via a P2P Interface (TMF)
DM	Domain Manager
DM-F	Domain Manager Function

EMF	Element Management Function
Itf-N	the Interface between the Network (Element Manager or NEs with an embedded EM) and the Network Manager; see 3GPP TS 32.101 [1]
Itf-P2P	The interface between peer Domain Managers
IRP	Integration Reference Point
MIB	Management Information Base
MO	Managed Object
NMF	Network Management Function
NRM	Network Resource Model
P2P	Peer-to-Peer

4 P2P Interface Concept

The present document proposes an enhanced Telecommunication Management (TM) architecture that aims to strengthen and simplify multi-vendor network management solutions by exploiting the rich available single vendor sub-network management functionality.

To achieve this, it defines:

Standardized peer-to-peer interfaces between sub-management functions to allow consistent management of the borders between the management domains. This includes cross-border operations, auditing and synchronization of common Network Resource Model elements and definition of the format for data exchange across these borders.

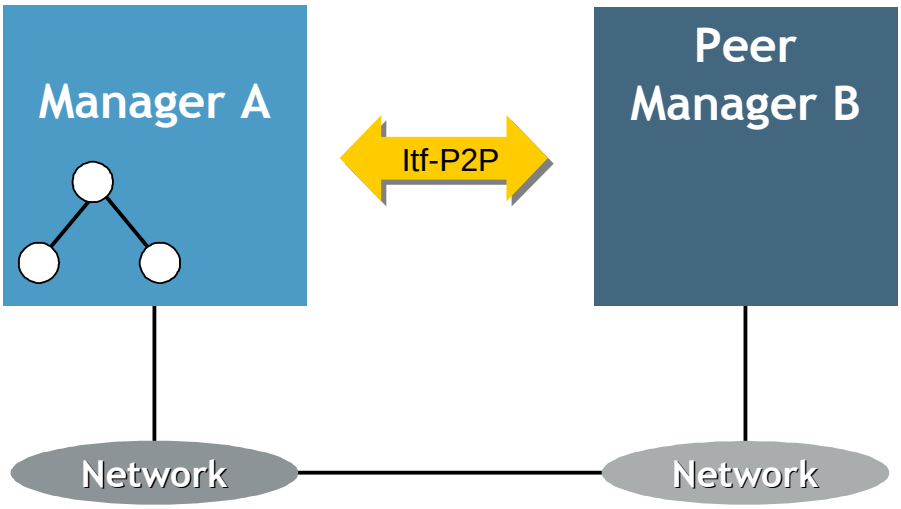

Figure 4.1: P2P Interface

4.1 P2P Interface Topology

This clause categorizes interfaces between network- and network management functions and describes their relevance for P2P application.

The concept of the P2P interface is to provide (multi domain) network management functionality by cooperative domain management functions. As a result, the network management layer comprises of centralized network management functions and distributed network management functions provided by cooperative domain management functions

The picture below (figure 2) is derived from 3GPP TS32.101 [1] clause 5.1 “Management Reference Model and Interfaces”.

It shows the existing structure of interfaces between management function blocks and extends it to include the P2P Interface. Domain Manager Implementations may vary by vendors in the termination of interface 2 (i.e. whether at Domain Manager, Element Manager or Network Element), however from the Manager perspective interface 2 (Itf-N) is not changed.

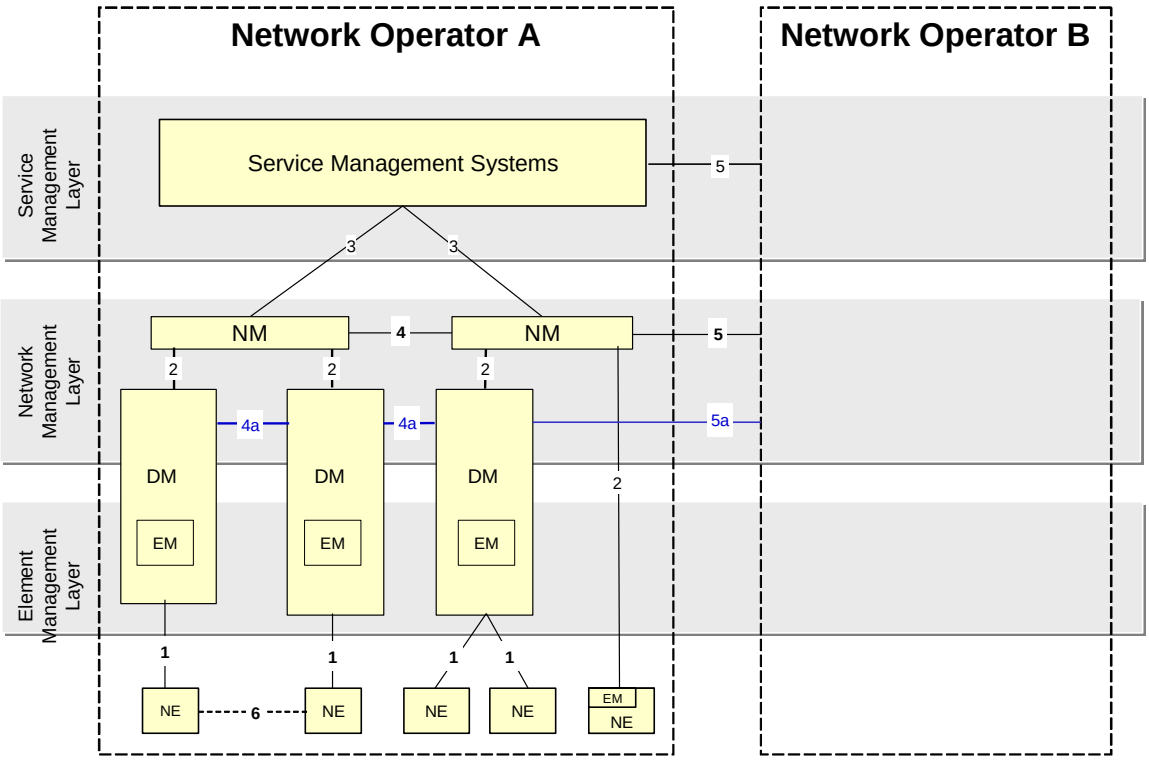

Figure 4.1-1: Interface Architecture

4.1.1 The Domain Manager (DM)

The DM function is instantiated as a DM which may also include traditional sub-network and element management functions. DMs collaborate with peer DMs to perform network management functions (CM, PM, FM) for groups of sub-networks with common borders. Network borders represent areas of necessary co-ordination between sub-network types or regions. For example managing the border between UTRAN and GERAN radio access networks is necessary to seamlessly support inter-radio handover operations. Similar borders exist between the radio access networks and the core network or the transport network that is used to provide connectivity for RAN Network Elements.

Collaboration between DMs to provide network management functions such as inter-sub-network border consistency audits is enabled through the use of Peer-to-Peer associations with other DMs. A new reference interface, Itf-P2P, is defined which encapsulates this functionality. Figure 4.1-1 above shows the Itf-P2P Interface (4a, 5a) and DM concept overlayed on the existing Management Interface Architecture from TS 32.101 [1]. Where Itf-P2P is within a single Network Operators domain it has been labelled as Interface type 4a (i.e. it is a variant of the existing type 4 interface from [1]). Note that Interface 4a appears at the Network Management layer, as the DM by definition spans both Element Management and Network Management layers. When Itf-P2P spans Network Operator Domains it has been labelled type 5a (i.e. it is a variant of the existing type 5 interface from TS 32.101 [1]).

As with the Itf-N, the Itf-P2P is split into a number of IRPs which define related subsets of the Itf-P2P functionality. As often as possible the existing Itf-N IRP specifications are re-used in the Itf-P2P where similar functionality is provided, but with a different context which may constrain or extend IRP behaviour when compared to Itf-N. Across the Itf-P2P DMs play both the IRPManager and IRPAgent roles.

Another aspect of DM collaboration is the definition of supporting infrastructure to provide functions such as discovery, naming, notification channel administration and identity management. In CO~OP these functions are termed Integrator Services and they support combining different vendors domain management systems to an integrated management solution. To provide commonality of approach we define each service in terms of one or more IRPs which DMs support in a client role. Finally a CO~OP Integrator Client function is defined which serves functions of multiple domain managers and provides an integrated view across multi vendor domains. DM Integrator Client IRPs are defined which enable this multi-vendor integration and give efficient access to DM functions. Many of these IRPs are based on the Itf-N IRP specifications. Integrator clients may also access Integrator services to support functions such as discovery, identity management, etc.

4.2 P2P Architecture

This clause describes how Domain Manager P2P interfaces can be designed based on the concept defined in 3GPP TS 32.150 [2]. P2P interfaces support inter-DM interactions that facilitate tighter integration of management services between sub-networks controlled by DMs. These interactions include for example configuration management of common or related (border) resources.

A key concept for the P2P interfaces is the Border MO. Border MOs are managed objects that are external or proxy managed objects in another DM. Border objects are already present in standard Network Resource Models. The basic intention of border modeling is to identify those parts of an NRM, which contribute to the interface between sub-networks. Responsibility for the storage, consistency and configuration of this border information is necessarily shared between multiple DMs. IRPs within the Itf-P2P provide a standard means to exchange this border information between DMs.

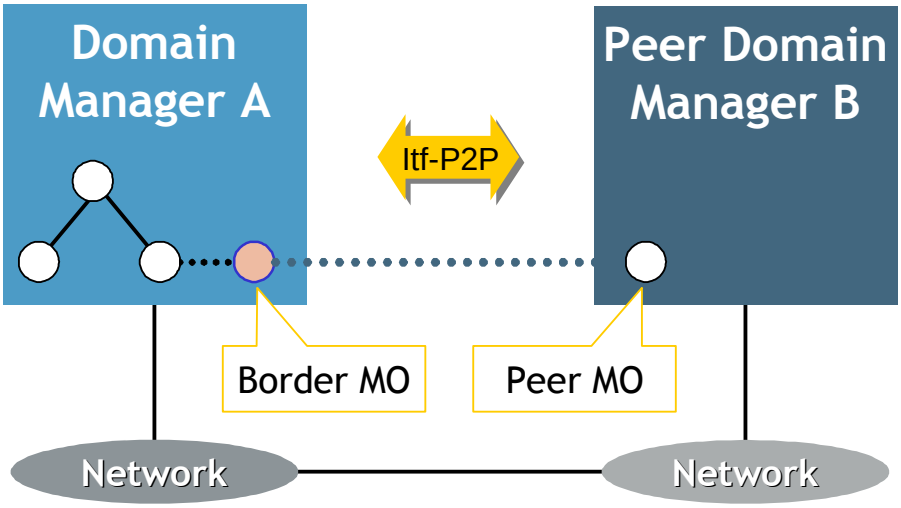

Figure 4.2-1: Border and Peer Managed Objects

4.2.2 Manager and Agent Roles for the P2P Interfaces

Figure 4.2.2-1 below shows the system context of the present clause in terms of implementations called IRPAgentA, IRPManagerA, IRPAgentB and IRPManagerB. Where IRPAgentA and IRPManagerA are resident in a single DM, named A. IRPAgentB and IRPManagerB are similarly resident in a single DM, named B.

The term IRPManagerA refers to a process that interacts with an IRPAgentB for the purpose of network management via a given P2P IRP. An example of an IRPManager can be resident in a Domain Manager. An IRPAgent implements and supports a given P2P IRP. It is also resident in a DM. Interactions between an IRPManager and an IRPAgent, or the underlying MIB of an IRPAgent within a single DM are not a matter for standardization.

In general IRP's used on Itf-P2P enable an IRPManagerA to collect a subset of the management information that is controlled by IRPAgentB for the purpose of updating or auditing related management data that is controlled by IRPAgentA. The data exchange mechanism is via IRPs. The data exchanged refers only to border MOs. Responsibility for management information stored locally, whether or not it is a replica of management information stored remotely, is the responsibility of the local DM only.

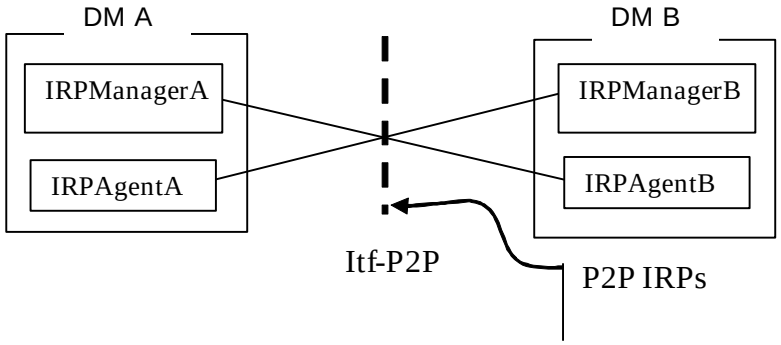

Figure 4.2.2-1: System Context and Roles for the Itf-P2P

4.2.3 Border Object Identification

NRMs model the borders between sub-networks with border objects and the relation(s) between border objects and local objects. The border NRM concept is a subset of the NRM concept. Border NRMs are standard NRMs but only contain MO instances that are proxy objects in another DM.

On the Itf-P2P only Border NRMs, rather than full NRMs, are exposed to the peer DMs. These contain only the MOs that form part of the border, and the objects in the containment hierarchy of those MOs. Other network resources (e.g. NodeBs) are not visible.

Border Object Classification and Modeling Relations

Border Objects are objects of a sub-network that have relations to one or more managed objects of another sub-network.

Relations may be unidirectional if only one side initiates border-crossing network operations, bidirectional if either side may initiate these operations.

This results in the differentiation between source border objects (initiator) and target border objects.

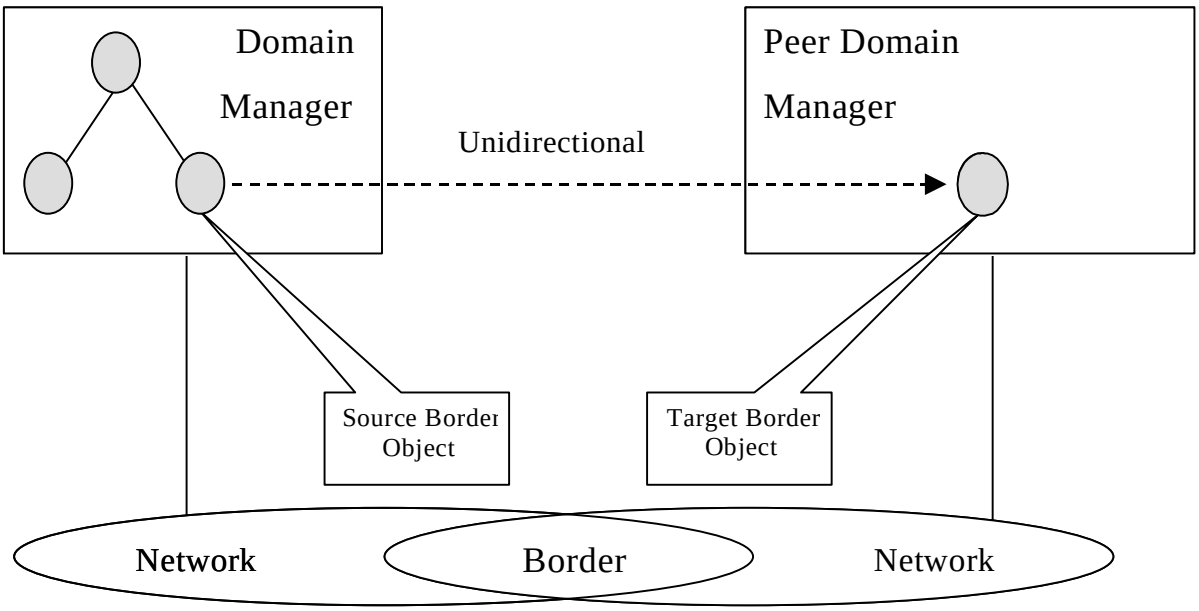

Figure 4.2.3-1: Modelling Borders with cross-border relations

Depending on the use case, source border objects related to a target border object may have a proxy object called an external object in the same MIB as the source border object. Within the NRMs external objects represent network border objects of other sub-networks that are the target of a relation (e.g. handover).

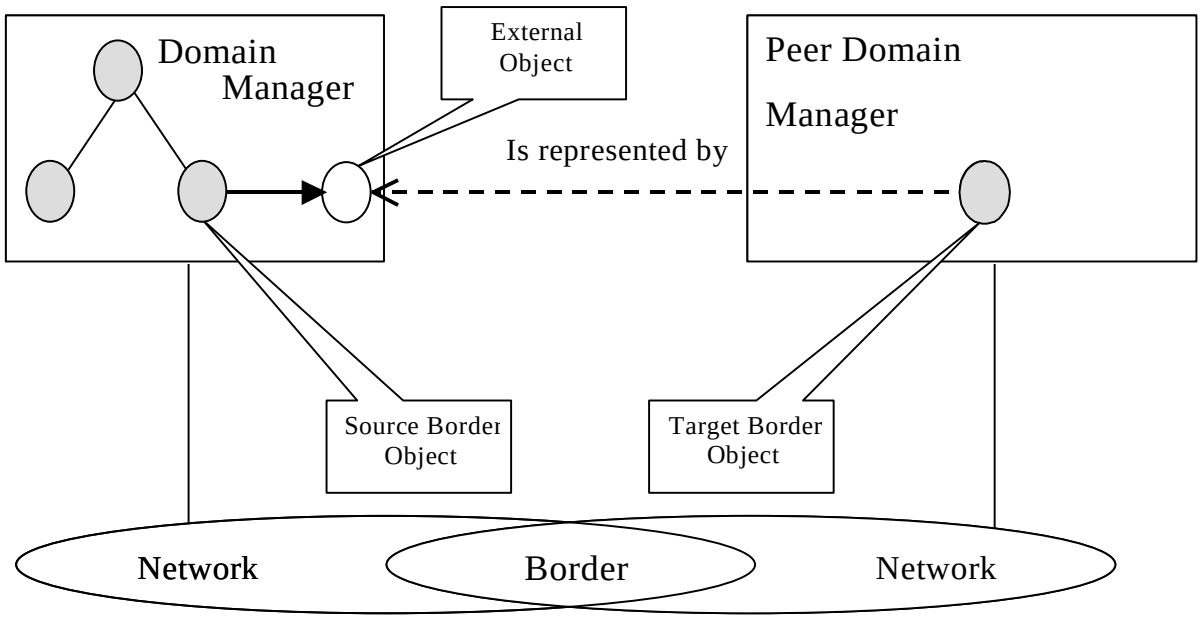

Figure 4.2.3-2: Unidirectional Borders modeled with External Objects

Bi-directional relations between border objects are more common (e.g. two-way handover) than unidirectional relations. Support for bidirectional relations requires external objects in both sub-network MIBs that share the border. This is illustrated in the following figure.

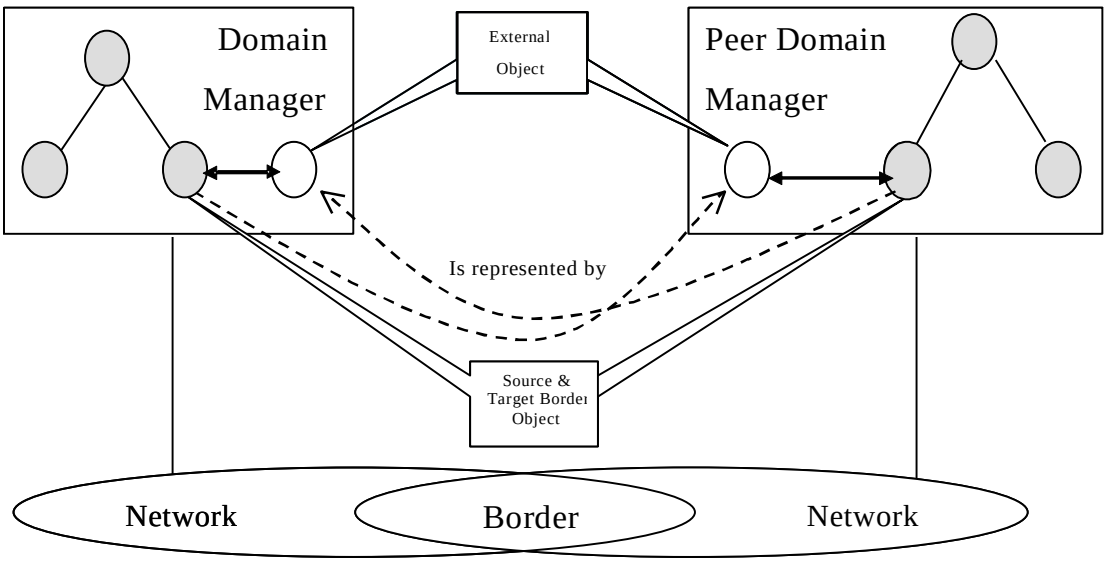

Figure 4.2.3-3: Bidirectional Borders modeled with External Objects

The attributes of external objects are a subset of the corresponding object attributes and contain any information needed to manage borders consistently across sub-networks. The information contained by external objects is information replicated from the corresponding object. Responsibility for the maintenance of objects within a local MIB is always the responsibility of the local DM whether these are source or external objects. The Itf-P2P provides support for the maintenance of consistency between external objects and their corresponding target object through auditing operations (synchronization support).

Reference Information between Border Objects

The following figure illustrates the use of the PersistentCellId attribute in external and target objects in two peer DMs.

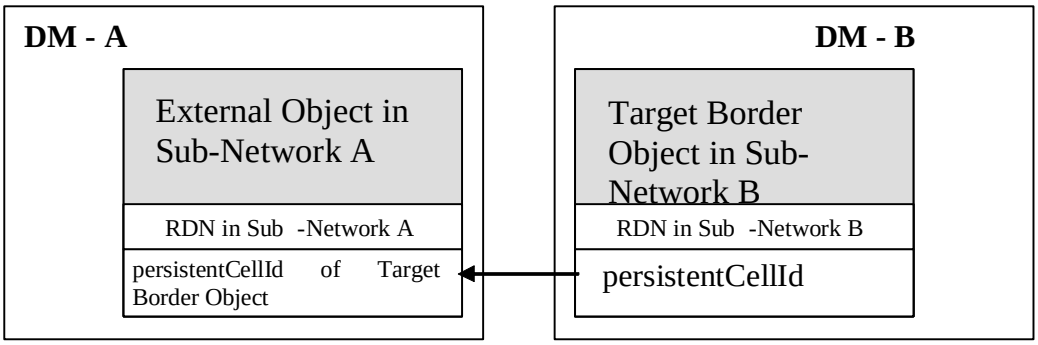

Figure 4.2.3-4: Reference information between border objects in two DMs

Annex A:
Change history

Change history								
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Cat	Old	New
Dec 2005	SA_30	SP-050730	--	--	Submitted to TSG SA#30 for Information		1.0.1	
Jun 2006	SA_32	SP-060262	--	--	Submitted to TSG SA#32 for Approval	--	2.0.0	