Resource Inventory Layout

Abstract

This document describes the inventory layout structure used in conjunction with the getResourceInventory operation.

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1 Inventory Layout Structure

The MTOSI getInventory operation allows an OS to request part or all of the inventory maintained by another OS. The response result set (Inventory snapshot) is logically organized according to the MTOSI naming convention and forms a collection of four trees data structures (Figure 1). Note, Figure 1 is not listing the entire set of inventory elements but just the structure notion of it.The inventory layout is used to organize, package, and carry the requested inventory information in the response to the getInventory operation regardless of the Message Exchange Pattern (MEP) used.

The first release of MTOSI will only include two MEPs: Asynchronous Batch Response and Asynchronous (File) Bulk. Refer to the Communication Style supporting document and the IA-SS mapping for a detailed description of the Communication Style and MEPs and supported in MTOSI.
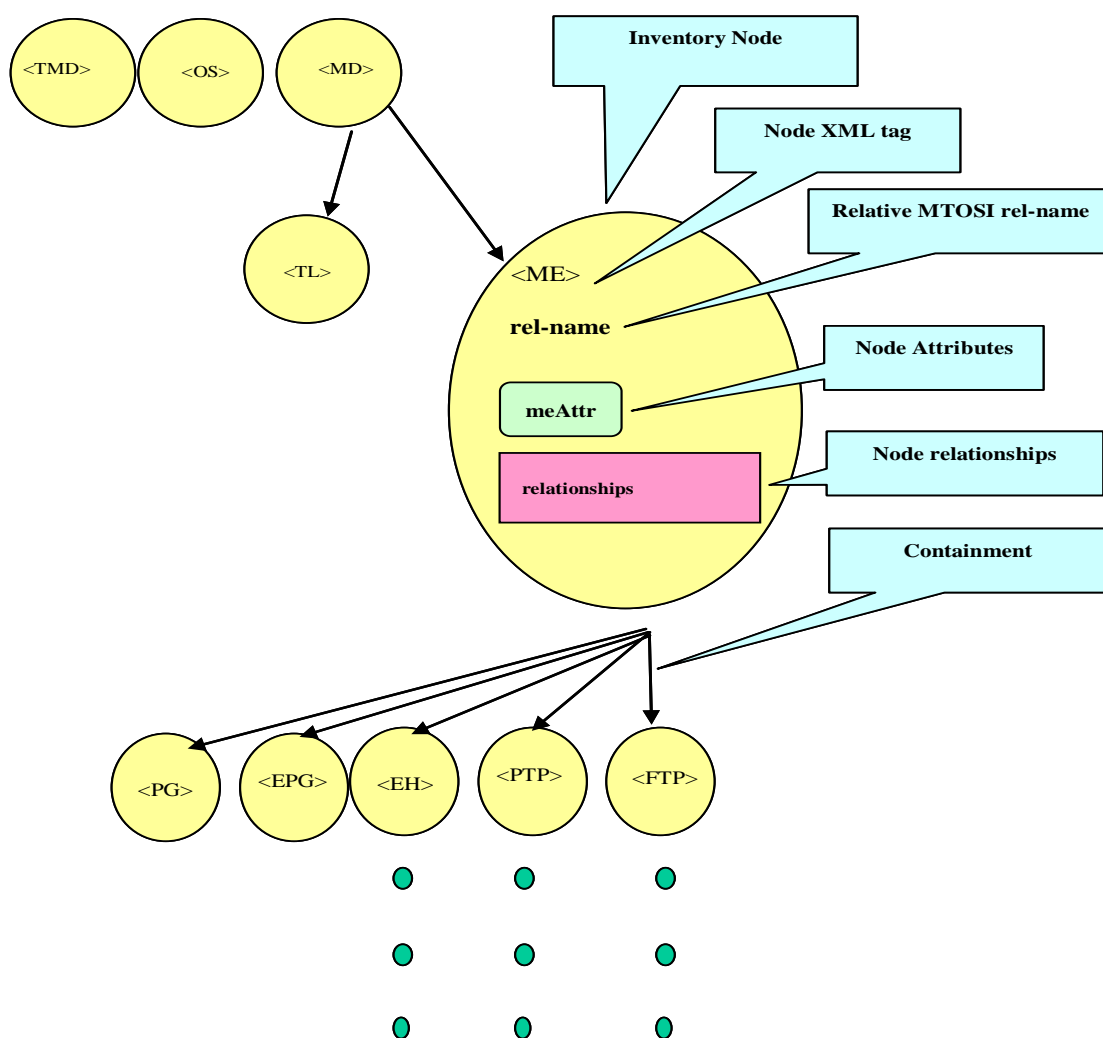
Figure 1 - Inventory hierarchical structure notion

Each node in the layout is called and "Inventory Name" because it contains an inventory of the components of a generic network element object. The Inventory Node contains the following optional components:

- node XML tag –the XML tag name for the network element object

- relative MTOSI name – the MTOSI name of the network element pruned of the name components of the ancestor node in the hierarchy.

- Node Attributes – the list of all the attributes proper of the NE as specified in the TMF 608 UML.

- Node Relationships – List of pointers (MTOSI names) characterizing relationships other than containment.

In the layout diagram (Figure 2), the containment of one box within another is used to represent the naming hierarchy. For example, Equipment Holders (EHs) are named under Managed Elements (MEs) and are thus represented as a box within ME. Further, and perhaps most important to the discussion here, the containment in the layout diagram is reflected in the associated XML for the inventoryData structure (this is used to carry the requested inventory data). Relationships (other than naming) are represented via the pointers, indicated in the pink boxes.
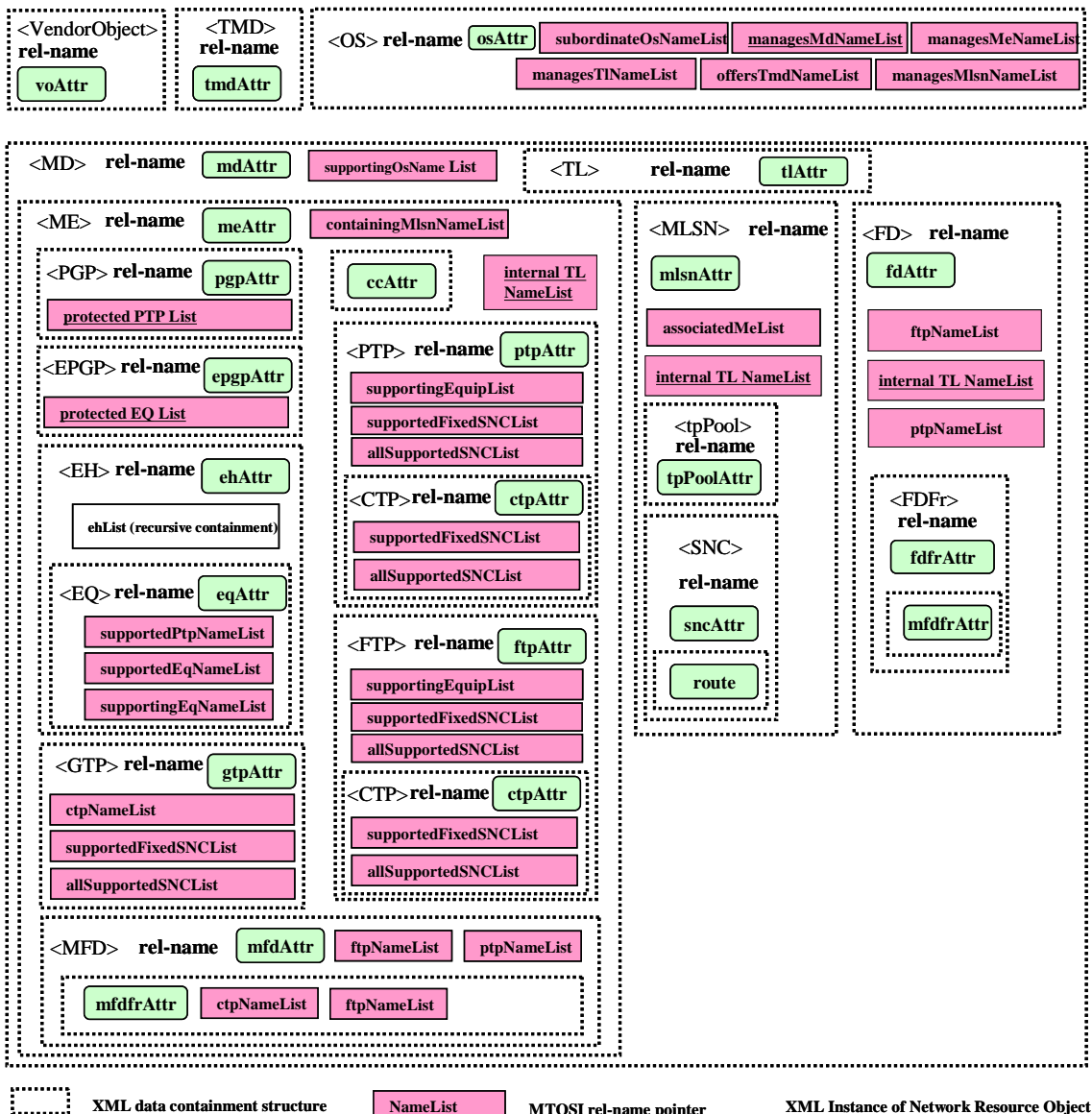
Figure 2 - Inventory XML layout

Starting from the top of the diagram, we have the following:

- The TMDs are at the top of the naming tree.

- At the top right are the OSs. This includes the top-level OS on the CCV (indicated by the value TRUE in its topLevel attribute) and all the other (subordinate) OSs known to the top-level OS (these OSs have their topLevel attribute set to FALSE). MTOSI defines additional relationships between the subordinate OS and the portion of the network that they manage but these relationships are not currently available via the inventory layout (for simplicity). The relationship can, however, be retrieved via the various "fine grain" style operations such as (for example):

  - getAllTopologicalLinksWrtOs

  - getAllTransmissionDescriptorsWrtOs

  - getAllManagedElementsWrtOs

- - - getAllMultiLayerSubnetworksWrtOs

- Also at the top-level of the naming hierarchy are the ever popular Management Domains (MDs). The MDs are used only for naming purposes to group portions of a network. Unlike subnetworks, there is no assumption that the objects within an MD are necessarily connectable.

- Each MD typically contains a collection of MEs, subnetworks, TrafficConditioningProfile and FlowDomains.

- FlowDomain conatins CPTP (== PTP|FTP) and Flow Domain Fragment

- FlowDomainFragment contains Route

- The naming under ME is fairly mostly straightforward.
  - MEs contain EHs which, in turn, contain EQ instances.
  - The EHs under an ME are returned in flat list. An EH can contain other EHs, and this is reflect via the name of the EH. This follows the MTNM convention.
  - In keeping with the MTNM convention, PTPs are named directly under MEs.
  - MEs also contain MatrixFlowDomains

- MatrixFlowDomain contains CPTP (== PTP|FTP) and MFDFr

- MFDFR contains FlowPoint (== TP)

- FDFr conatains FlowPoint (== TP)

- The naming under Subnetwork needs a little further explanation for those not familiar with TMF 608. MEs are named directly under MD, but a subnetwork is defined as a collection of MEs connected by TLs. The relationship between a subnetwork and its MEs and between a subnetwork and its TLs via non-naming associations. Only the names of the MEs and the names of the TLs appear under the Subnetwork (not the complete structure).

2 Partitioning of Inventory Segments

The amount of information requested in a given invocation of getInventory can be quite large, and so the multiple responses or retrieval (in the case of iterators) will likely be needed. In such cases, the requested inventory needs to be broken (partitioned) into pieces that can easily be reassembled by the requesting OS. In particular, we have the following statement from TMF518_MRI:

> "*The inventory document may be partitioned in any manner provided that:*

> - *Individual object instances (but not necessarily the fully containment hierarchy) are completely contained in a single partition*

> - *The full details of an object instance may only appear in one partition but to set context, it may be necessary to include the object instance with just its name in several partitions.*

> - *The receiver can reconstruct the document as the various partitions are received. So, for example, if the hierarchy of an ME is to be sent in multiple partitions, the context of each partition needs to be present: in this example, the MD and ME objects with just their names and whatever part of the ME hierarchy that is to be transported in the given partition.*"

3 Absolute and Relative MTOSI Names

MTOSI follows, very closely, the MTNM naming conventions. In particular, each managed object is given a fully distinguished name that allows one to completely determine the object's position in the naming hierarchy. In general, object names are always characterized as the full hierarchical name described in the "SD2-7_v1.0_Object_Naming"

Where it is clear and not ambiguous from the message context that an object belongs in the full hierarchical name structure, a Relative Distinguished Name (RDN) is used.

The RDN holds only the name component for that object, and not its superior name components.

Note that this notation will not affect the way a network resource is addressed by its MTOSI name, but rather simply shorten the notation of an MTOSI name in a context of a message structure.

In the inventory layout, the data is organized according to the naming hierarchy and MTOSI relative Distinguished Names are used in the names of the network objects within an "inventory node". Note the name in the pointers as well as the name in the object attributes is still absolute.

4 CTPs in the Inventory Layout

The MTNM model defines three types of CTPs, i.e.,

1. An *In Use* CTP is defined as a CTP that is used by an SNC in any state (including pending) or a CTP that is terminated and mapped (either with or without assigned bandwidth).

2. A *Current* CTP is a CTP that is either cross-connectable or cross-connected, in the current mapping configuration. The set of current CTPs with respect to a containing TP contains the set of In Use CTPs.

3. A *Potential* CTP with respect to a given containing TP is a CTP than can possibly be created for a given channelization of the containing TP. The set of Potential CTPs with respect to a containing TP contains the set of In Use and Current CTPs.
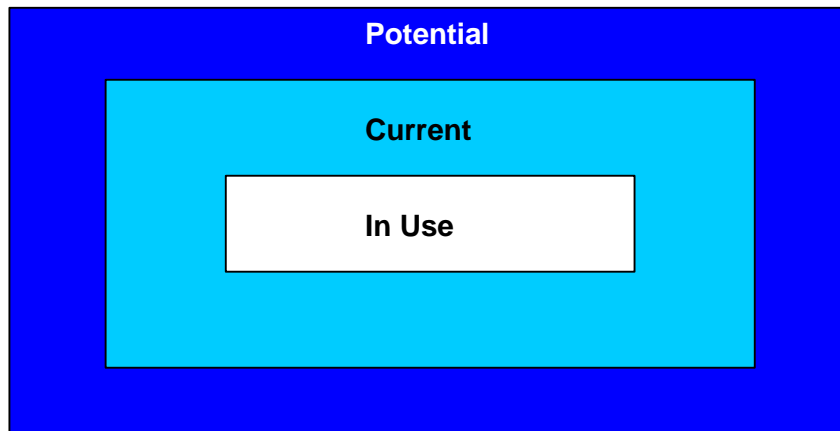
Figure 3 - Potential, Current and In Use CTPs with respect to a Containing TP

The MTOSI getInventory operation only returns Current CTPs which as noted, includes the set of In Use CTPs. In order to get the full set of potential CTPs, a requesting OS needs to use either the getContainedPotentialTPs or the getPotentialTPNames operation.

The structure returned in response to the getInventory operation does not mark the CTPs as being In Use or Current but the requesting OS can make the determination as follows:

1. A CTP is In Use if either

    a. its connection state is TPCS_SOURCE_CONNECTED, TPCS_SINK_CONNECTED or TPCS_BI_CONNECTED, or

    b. its termination mode is TM_TERMINATED_AND_AVAILABLE_FOR_MAPPING.

2. In addition to the In Use CTPs (as determined in the previous step), any other CTPs returned in response to the getInventory operation can be assume to be Current.

5 Considerations on Future changes to the Inventory Layout

The inventory layout has the same versioning properties of the rest of the XSDs. Adding optional structures on the tree will be a minor change. Removing branches will be a major change. Adding optional attributes in the node will be a backward compatible minor change.

6 Related supporting documents

SD2-9 (MTOSI object naming convention) contains the detailed naming conventions to be used in the XML names.

7 Administrative Appendix

7.1 Document History

Version	Date	Description of Change
1.0	May 2005	This is the first version and as such, there are no changes to report.
1.1	Dec 2005	Added member evaluation feedback
2.0	Oct 2007	Incorporated change requests for MTOSI 2.0 - Added GTP in ME - Removed TL from toplevel - Changed TL to be a reference in MSLN - Added TL reference in ME - Added Appendix "how to use MTOSI names for SubNetworks" - Added Connectionless elements
2.0.1	Dec 2007	Incorporated change requests from mTOP call Nov 28 - renamed element relationships to reflect IA (underlined in Fig 2) - added supportedFixedSNCList and allSupportedSNCList to PTP, CTP, FTP and GTP
2.1	May 2008	Different modifications based on MTOSI R 2.0 review comments.

7.2 How to comment on this document

Comments and requests for information must be in written form and addressed to the contact identified below:

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Please be specific, since your comments will be dealt with by the team evaluating numerous inputs and trying to produce a single text. Thus we appreciate significant specific input. We are looking for more input than wordsmith" items, however editing and structural help are greatly appreciated where better clarity is the result.