B. MANAGED TOPOLOGY AND UNDERLYING INTERFACE FILES STRUCTURE

The managed topology and underlying interface files are needed for the correct bootstrap of MANBoP or when the topology is being modified. They contain the necessary information to create the corresponding Information Model objects that represent the managed topology and underlying devices.

These files must follow a concrete structure so that they can be recognized and processed by the MANBoP system (i.e. by the GraphBuilder class inside the PCM component).

In this appendix we describe the structure of these files and the type of information that they provide. Both files follow a tagged-like structure, although simplified and particularise to our needs, to ease their creation and processing.

Section B.1 – Managed Topology file

The managed topology file contains information about the nodes and links that conform the managed network and their intrinsic resources.

The information is structured around the nodes, Table B - 1 shows an example file. Inside *'<node>'* tags all node resources, including outgoing and incoming links, are listed.

Those properties that are tied to the node, and therefore will be part of the corresponding Node Information Model object, are listed right after the *'<node>'* tag in the following order: nodeId, type, edge, OutL, InL. These properties represent respectively, the node identifier (string containing the IP address of the node), the type of node (passive, active or programmable), whether the node is an access point or not, the list of links leaving the node and the list of links entering the node. The MANBoP system captures the value coming right after *':'*. In the case of the OutL and InL, it captures all values separated by commas.

Immediately after the node properties the passive resources (*'<PResources>'*) and the active resources (*'<AResources>'*) are listed. Passive resources contain exclusively the resources associated to each one of the node outgoing links. These properties are enumerated within the *'<link>'* and *'</link>'* tags. There are as many sets of link properties as outgoing links are specified for the node. The link properties are listed in the following order: link identifier, source node, sink node, number of hops between the source and the sink

nodes and the total link capacity. In all cases the system captures the value coming right after *':'*.

Finally, only when the node is an active or programmable node, the system also captures the node active resources. These resources are given as a number of properties listed within the *'<AResources>'* and *'</AResources>'* tags. The active node resources are listed in the following order: total number of CPU cycles, disk in kb, memory in kb, the number of EEs available in the node and the identifiers of these EEs separated by commas.

Managed topology file
| ```
<node>
        nodeId:147.83.106.111
        type:1
        edge:1
        OutL:ad,ac
        InL:da,ca
        <PResources>
                <link>
                        linkId:ad
                        sourceNode: 147.83.106.111
                        sinkNode:147.83.106.114
                        hops:0
                        capacity:0
                </link>
                <link>

                        linkId:ac
                        sourceNode: 147.83.106.111
                        sinkNode: 147.83.106.113
                        hops:0
                        capacity:0
                </link>
        </PResources>
        <AResources>
                CPU:0
                Disk:0
                Memory:0
                NumberofEEs:0
                EEIds:
        </AResources>
</node>
<node>
   …
</node>
   …
``` |

Table B - 1. Managed topology file example

Section B.2 – Underlying Interfaces file

The underlying interfaces file contains information about the type of devices the MANBoP system is working over and how to access them. This information is given in the underlying interfaces file in the same format irrespectively of whether the underlying devices are lower-level MANBoP instances or managed devices.

The structure of the underlying interfaces file is simpler to the managed topology file. An example can be seen in Table B - 2 below.

The information is contained within *'<device_id>'* and *'</device_id>'* tags. The device identifier has the same value as the node identifier. There is device information for every managed node (to ease and speed up the location of the device information linked to a node). The MANBoP system captures the device identifiers from the file and extracts its attributes from the properties listed within. These properties are listed in the following order: interface identifier, nodeSet identifier, nodeSet location value and device address value. For each device the system captures the values right after *':'*.

The interface identifier is used to determine which version of the management components (i.e. Policy Consumers and Monitoring Meters) should be downloaded and installed within the system when needed.

The nodeSet information is given in two values. The nodeSet identifier is given to uniquely identify the nodeSet within the system. This identifier is constructed joining the IP address of the machine where components for this nodeSet must be installed, with the interface identifier of machines included within this nodeSet. The nodeSet location value points to the exact location (i.e. directory) where management component linked to that device (e.g. Policy Consumers) must be placed.

The address value indicates how to access the underlying device. This information will be used to create the corresponding Device Information Model objects.

Finally, there is an info value that might contain zero or more strings separated with spaces. These strings will provide extra information that might be needed to correctly contact the underlying device. For example, when the underlying device is a lower-level MANBoP instance, the info field contains a number indicating the MANBoP instance identifier of this instance.

Underlying Interfaces file

<147.83.106.111>
        interface:FAIN
        nodeSetId:147.83.106.111_FAIN
        nodeSetLoc:E:\Users\workspace\MANBoP\es\upc\nmg\MAN
BoP\dynComps\FAIN
        Addr:147.83.106.111/26
        info:
</147.83.106.111>
<147.83.106.112>
                interface:FAIN
        nodeSetId:147.83.106.112_FAIN
        nodeSetLoc:E:\Users\workspace\MANBoP\es\upc\nmg\MAN
BoP\dynComps\FAIN
        Addr:147.83.106.112/26
          info:
</147.83.106.112>
<147.83.106.113>
        interface:CISCO_7200
        nodeSetId:localhost_CISCO_7200
        nodeSetLoc:E:\Users\workspace\MANBoP\es\upc\nmg\MAN
BoP\dynComps\CISCO7200
        Addr:147.83.106.113/26
        info:
</147.83.106.113>
<147.83.106.114>
        interface:CISCO_2600
        nodeSetId:localhost_CISCO_2600
        nodeSetLoc:
E:\Users\workspace\MANBoP\es\upc\nmg\MANBoP\dynComps\CI
SCO2600\
        Addr:147.83.106.114/26
        info:
</147.83.106.114>

Table B - 2. Underlying interfaces file example