ANNEX TO THE DECISION REGARDING BROBA 2007
QUANTITATIVE DESCRIPTION OF THE METHODOLOGY IN THE BOTTOM-UP MODEL TO DETERMINE THE NETWORK RELATED TARIFFS FOR BROBA

21 November 2006

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0. INTRODUCTION

0.1. *SITUATING THE DOCUMENT*

In the framework of developing a bottom-up method to determine a cost model for the BROBA tariffs BIPT has modeled the relevant parts of the network used by the Belgian incumbent for that purpose based on a *scorched node approach*. This annex describes the method followed for determining an efficient inventory of network components, based on that approach. The ultimate goal is to obtain a survey of all necessary components and their volumes. This result then constitutes a direct input into the actual bottom-up cost model for determining the BROBA tariffs, which will be discussed in the second part of this document.

This first part aims at giving a detailed description of the various steps taken to establish that inventory, as well as the motivation of BIPT of how it has proceeded.
The various steps in the modeling are gone over and the detailed results are also presented.
When relevant reference is made to the sources of information used.

0.2. *MOTIVATION FOR CHOOSING A BOTTOM-UP MODELING*

0.2.1 FOR DETERMINING THE BROBA SPECIFIC PART OF THE END-USER LINE

As described in the consultation document, considerations regarding achieving more transparency are the main reasons for the Institute to opt for a bottom-up approach to determine the accepted costs related to the end-user line and which mainly depend on the cost of the DSLAMs.

Indeed, the cost model used until now, uses global ratios for fill rates and such, which are probably correctly based on the actual situation as planned in the middle of the year of reference, but regarding which the Institute and the sector are unable to verify whether they are representative of an efficient operator's network. The use of a bottom-up model should help to solve this problem.

In addition, a number of market evolutions make it advisable to allow for the possibility to evaluate the impact of certain influences based on a number of scenarios. The new bottom-up model will enable us to verify in a simple way the impact of such scenarios on the costs, so as to take any corrective measures on that basis.

0.2.2 *For the ATM tariffs*

For the ATM tariffs too the choice of a bottom-up approach was mainly made for reasons of non-discrimination and more transparency.

Indeed, the SMP's ATM network is a common infrastructure shared with a number of other services which are completely outside the scope of the BROBA offer and the SMP's equivalent offer.

The use of a top-down approach therefore requires a distribution of the costs concerned between BROBA-related and non-BROBA-related costs. However, since the underlying cost components cannot be attributed unequivocally to a specific service, the cost distribution in the former BROBA tariff determination was based on the bandwidth used per service.

However that approach does not take sufficient account of the fact that the underlying cost structures of the various services are not necessarily uniform, which means in practice that certain services are favoured or put at a disadvantage compared to others when determining tariffs.

That way it is also impossible to form an opinion about the evolution of the network, since new investments and extensions cannot be coupled unequivocally to certain services.

Finally, the former approach was little transparent and unverifyable for the market. That is why the aim of choosing a bottom-up approach is to eliminate those problems.

0.3. *Scope of the exercise*

In defining the scope of the exercise a distinction is made between the technical and the geographical scope.

0.3.1 *Technical scope*

0.3.1.a In terms of the modeled network

The scope of the exercise, of which the method is explained in this document, includes the entire infrastructure that is needed to offer broadband services.

The outline below lists the network components included in the specific inventory exercise for the broadband services:

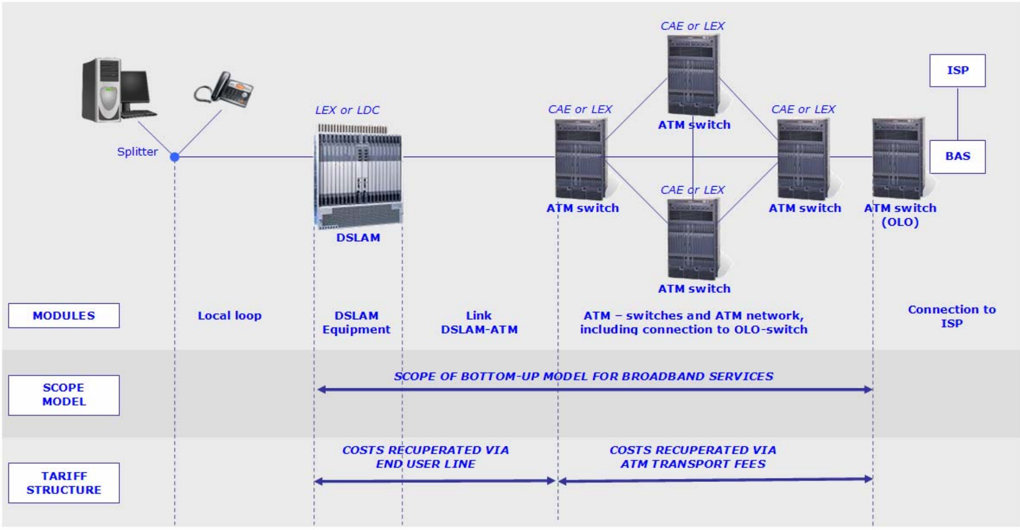

Figure 1: Technical scope of the modeled netwerk components for the provision of broadband services

The locations where the equipment is situated, the links between the various locations and to the OLOs and in some cases also the equipment used for the broadband services, are shared with other services offered by the incumbent operator.

When dimensioning the volumes needed, account shall only be taken of the proper broadband services, however. Yet, this does not mean that those other services will be ignored completely. When relevant further details will be given below of how this has been done.

0.3.1.b IN TERMS OF THE MODELED SERVICES

The volume of broadband customers has been determined by taking both retail and wholesale services into consideration. Indeed, BIPT thinks that as for infrastructure there is no reason to consider a cost structure or cost level that is different for retail services and for wholesale services. Therefore, BIPT takes the view that equal treatment of all broadband customers constitutes the best guarantee for respecting the non-discrimination principle.

0.3.2 GEOGRAPHICAL SCOPE

BIPT has expressly opted for modeling the complete network (i.e. covering the entire territory) used for providing broadband services. This implies that no use was made of samples, the results of which were then extrapolated. Nor was the exercise restricted to certain more urbanised areas or locations where a lot of bitstream access services are already being sold. Indeed, BIPT takes the view that there can be no reason to stimulate the offer of broadband services in a certain region to a larger or lesser extent for geographical reasons.

0.4. *IMPLEMENTATION OF THE EFFICIENCY CONCEPT*

When making the inventory of components in the local loop, BIPT has seen to it, in accordance with the Recommendation of 19/09/2005[1], that this inventory was established as efficiently as possible. At the same time BIPT has also made sure that reasonable account was taken of the reality within Belgacom.

Efficiency is a criterion that can be evaluated at various moments during the establishment of an inventory exercise. As a consequence, where relevant, this document will examine explicitly the assumptions having an impact on the efficiency of the modeled network.

0.5. *SURVEY OF THE VARIOUS STEPS IN MAKING THE INVENTORY*

The subsequent steps to make the inventory of units, on which unit prices can then be applied to, are presented in the following diagram.

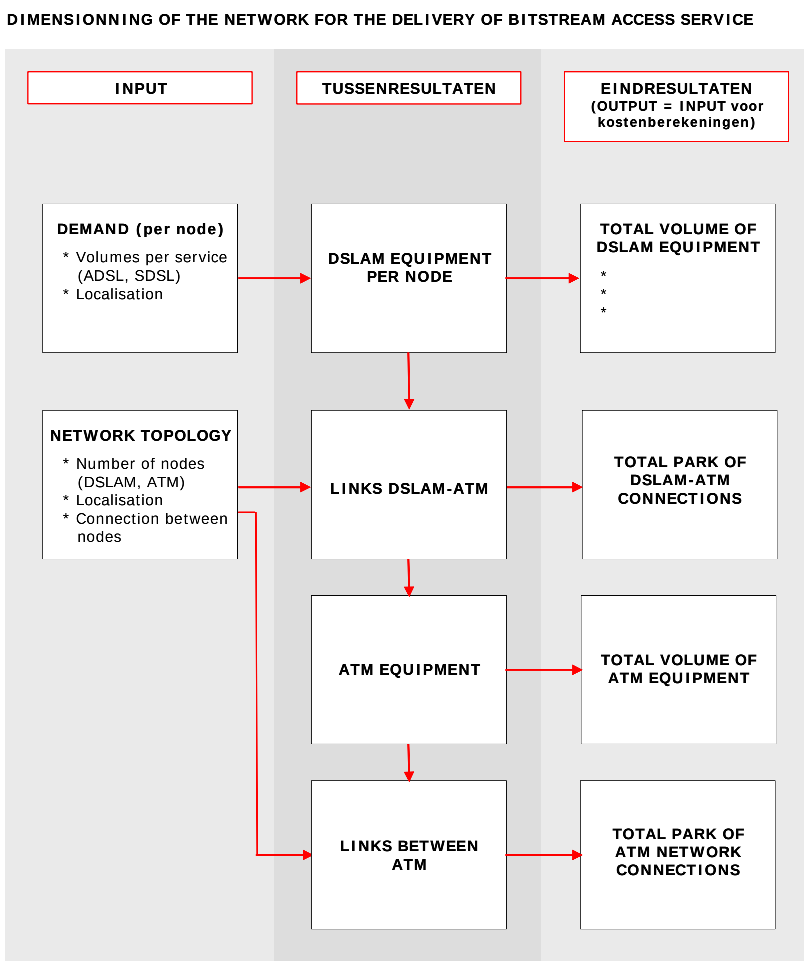

Figure 2: Step-by-step plan regarding the inventory exercise

[1] Recommendation 2005/698/EC.

Detailed information about the demand for broadband services on the one hand and about the network topology on the other constitutes the input for the dimensioning exercise. As for demand BIPT has opted for a type of dimensioning that takes account of the real situation in each individual node with DSLAM equipment.

The dimensioning is done for each of the components at the level of the individual nodes and the individual links between the nodes.

The aggregated results of the dimensioning exercise then show the total volumes per component. The latter form a direct input for the actual calculation of the tariffs.

The input, intermediate results and final results regarding the inventory exercise are discussed in detail and motivated in the following chapters.

1. INPUT FOR THE INVENTORY EXERCISE

As shown in figure 2 the point of departure when elaborating the modeling is the information regarding the volumes of broadband customers, the location of the nodes where DSLAMs and ATM switches are situated and the way in which these nodes are interlinked. All of this is mainly based on information obtained from Belgacom itself.

1.1. *DEMAND: VOLUMES OF BROADBAND CUSTOMERS*

1.1.1 PRINCIPLE

When determining the demand volumes as input for the bottom-up model, BIPT has firstly taken the number of broadband customers in the middle of 2006 as a guideline. This total volume consists of the following service categories:

- ADSL customers of the incumbent operator
- SDSL customers of the incumbent operator
- BROBA ADSL lines
- BROBA SDSL lines

ADSL 2+ volumes were not included as at the moment of elaborating the bottom-up model BIPT did not yet have a clear view of the realistic expectations. If in the future changes would occur regarding the inclusion of ADSL2+, a new modeling would be performed that takes account of the new situation.

Apart from the current situation account also needs to be taken of the future evolutions to be expected in the total volumes of ADSL and SDSL services. After all, on the market evolutions may be observed having a positive impact (e.g. further increase of the success of broadband) as well as evolutions having a negative impact (e.g. migration of Belgacom customers towards ADSL 2+ or migrations from BROBA to BRUO).

1.1.2 ELABORATION

Specifically the starting point was detailed statistical information regarding the number of users per type of line, per type of DSLAM and per location related to the network configuration on 19 July 2006.

BIPT thinks this source to be the most detailed, reliable and consistent and appropriate to take as the basis for the demand volumes for the bottom-up modeling of the network for providing broadband services.

1.1.2.a VOLUMES CONSIDERED IN BIPT'S APPROACH

For the moment the Institute prefers to maintain a cost determination that is based on the estimated volumes for the middle of the year of reference, because that way the introduction of new technologies can be compensated most easily and also certain market shifts can be taken into account. The prospects for next year already indicate that the growth of the total number of users is clearly diminishing.

The estimation of the volumes in the middle of 2007 was made by BIPT based on the information provided by Belgacom and other operators at the request of the Institute.

The Institute thinks this procedure is necessary because market evolutions are to be expected about which Belgacom itself cannot have a full idea. This was even confirmed by Belgacom itself. That is why the Institute itself has tried to make a realistic estimation of these evolutions and their impact on the efficient use of the infrastructure.

Starting from this information the Institute has then applied a number of algorithms, which take into account the following factors among other things:

- expected growth of the number of broadband users
- possible impact of shifts within Belgacom's proper customer base (e.g. a shift from ADSL towards ADSL2+ by migrating to Belgacom TV)
- possible impact of shifts within the OLOs' customer base (e.g. migrations between BRUO and BROBA)
- the non-homogeneous spread of these influences over the various locations.

Considering these different influences the Institute finally arrives at an expected growth of the combined ADSL/SDSL/BROBA market of approximately 5 %. In view of the non-homogeneous spread over the various locations this also means however that in certain places a clear drop of the number of ADSL/SDSL/BROBA users is to be expected.

1.1.2.b EVALUATION OF THE EFFICIENCY REGARDING THE ESTIMATED VOLUMES MID-2007

The fact that in some places the number of users may drop, is a break with the past and may influence the efficient use of the infrastructure. That is why the Institute has examined to what extent the various parties may suffer damage by this.

The Institute has found that on a number of locations the combined effect of all influences leads to a fall of the number of connected users and so probably to a less efficient use of infrastructure. Yet this does not apply to one party only. Indeed, when ignoring either the expected proper migrations of Belgacom or the migrations of the OLOs, the Institute finds that also on the locations where in the 2007 forecast the steepest fall is expected, there is now a marginal growth of 0.4 %.

In addition the Institute has studied the theoretical financial impact of the various market shifts and has therefore conducted a number of simulations with variations of the 2007 forecast.

The finding of the Institute is that in case of a modeling without any migrations (Belgacom and OLOs) the final cost price per ADSL user would be around 2 % lower. With modelings without migrations of both OLOs and Belgacom the price difference is each time about 1 %.

These small price differences are a logical consequence of the fact that the current DSLAM configuration is so big (1.3 million users, spread over 900 locations), that further growth of the customer base hardly entails any scale effects any more. Indeed, a further increase by 100,000 customers for instance, may entail a more efficient use of racks or line cards in some places, but will require the installation of extra racks in other places. Therefore the net effect is very limited.

Based on these analyses the Institute therefore concludes that there are no reasons to take extra measures to allow for the expected market shifts. These shifts have no substantial influence on costs and are caused by all parties to more or less the same degree. The 2007 forecast calculated by the Institute is therefore taken as the basis for the modeling without any further adaptations.

1.2. *NUMBER AND LOCATION OF THE NODES*

1.2.1 PRINCIPLE

The bottom-up exercise is based on a "*scorched node approach".* This means that BIPT takes into consideration the real *number* and the real *location* of the nodes where DSLAM or ATM equipment of Belgacom is situated when making the bottom-up model. That equipment is situated respectively in a LEX or LDC or in a CAE/AGE or LEX.

1.2.2 ELABORATION

1.2.2.a LOCATION OF THE DSLAM NODES

The inventory of 19 July 2006 lists all the locations (LEX or LDC) where one or more DSLAMs are situated. BIPT has compared the information about the location of the LEXs and LDCs in that database with other sources, such as the Excel tables on the *'Personal Pages'* (secured website) of Belgacom. There detailed information is given for each LEX and LDC among other things regarding location[2].

By comparing both databases of Belgacom network nodes it became clear that:

1) there are often inconsistencies in naming the nodes;

[2] The location is defined by means of Lambert co-ordinates (X, Y).

2) the actual nodes registered in the database are not consistent either;
3) for various nodes no location can be specified by Belgacom (not even after repeated urging).

Despite the gaps in the information BIPT has understood that these are the most recent and complete sources of information Belgacom is able to provide.

As BIPT starts from a *scorched node approach* for making the bottom-up model, the information regarding the real nodes in the network was completed as well and as much as possible, in order to be used later on as input during the inventory exercise.

1.2.2.b LOCATION OF THE ATM NODES

The information concerning the location of the ATM nodes was provided by Belgacom in the file indicating the link between the DSLAMs and the ATM nodes[3]. It was completed with the information given in the mail of 14 November 2006 (about the missing network information for 11 LDCs or so).

1.3. *TOPOLOGY*

1.3.1 PRINCIPLE

The choice of a *"scorched node approach"* implies that, unlike a *"modified scorched node"*, no changes are made to the nodes' *functionalities*. In accordance with that choice BIPT has decided moreover that the real mutual relations *between* the nodes should be maintained as much as possible.

That choice has been made because at present there are no indications that in the current distribution of the network nodes and the connections between them, there should be any inefficiencies that are not the consequence of the normal historical evolution of that network.

Moreover, the Institute is not in favour of a too strict *LRIC-style* approach where costs are determined on the basis of a completely optimised theoretical network *("greenfield approach")*. The Institute bases itself on the following considerations:

- The bitstream access market is marked by a quickly evolving technology and too strict a cost orientation would inappropriately put all investment risk with the SMP and as such take away all stimuli for further expansion of the network and further innovation.
- Contrary to Belgacom's copper network the DSLAM/ATM network is an infrastructure where an OLO may consider to take on the competition using his own infrastructure and therefore with a more differentiated offer. The Institute is in favour of such a form of competition. Determining tariffs oriented on costs that are based on a fully optimised DSLAM/ATM network would therefore not give the market signals wished for by the Institute.

[3] E-mail Mr Dibajlo of 9 november 2006, file: 061109_NetworkInfos.xls

- In the same way, costs based on a fully optimised network could result in tariffs that disturb the market because competitively speaking they are too favourable vis-à-vis the fully unbundled offer.

1.3.2 ELABORATION

The graph below shows the topology taken into consideration by BIPT for the theoretical modeling:

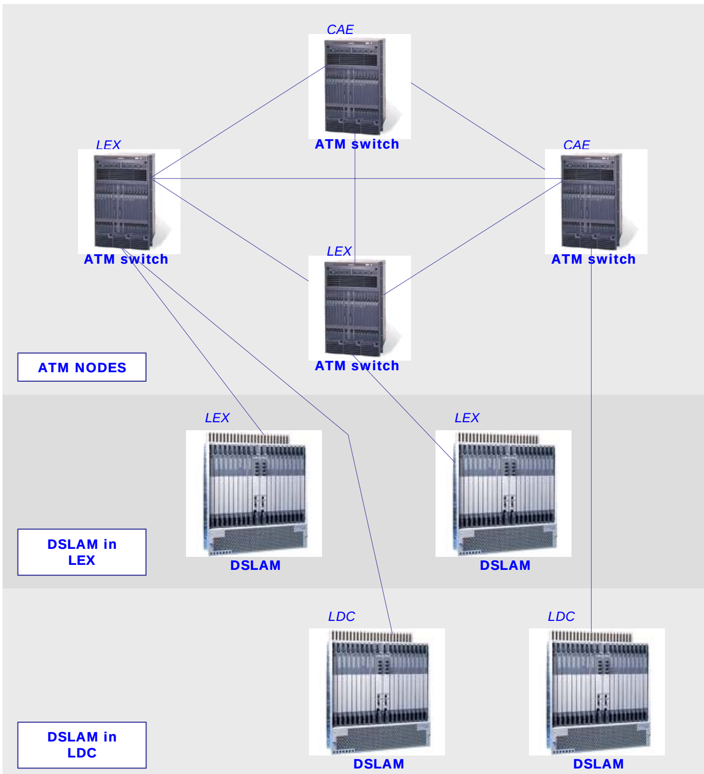

Figure 3 Diagram of the topology of the specific network components in the BROBA bottom-up model

The information provided by Belgacom has shown that the network topology has evolved in the last few years in certain aspects. More specifically the increasing installation of DSLAMs in LDCs has had the effect that Belgacom has opted for the use of so-called aggregators at LEX level. By doing so the network connections of the various LDCs are bundled at the level of their *parent LEX* and then linked to the ATM network by way of a single or a limited number of network connections.

From the information provided by Belgacom it should be deduced however that this approach combined with the Release 4bis DSLAMs (used in the BIPT modeling) is useless.

Thus, BIPT's theoretical model takes into account direct links between LDCs in which a DSLAM is situated and the ATM node the parent LEXs of which depend on these LDCs.

Furthermore, for the practical application of this bottom-up approach BIPT has based itself to a large extent on the SMP's existing network topology, which means that the location of the ATM nodes is not changed compared to the SMP's real network.

However, in order to remain consistent with the BROBA cost model in some respects there are deviations from that real network. These are some of the differences:

- Network connections are dimensioned only for those DSLAMs resulting from the bottom-up DSLAM model. In practice this means that the ATM model includes less network connections between the DSLAMs and the ATM network than in the SMP's real network. This logically follows from the fact that the bottom-up dimensioning of the DSLAMs is based only on Release 4bis DSLAMs, which leave a bigger "footprint" than the older types.
- All DSLAM-ATM connections are supposed to be of the STM-1 type. In practice the SMP's network still includes a number of E-3 links.
- No account is taken of the aggregators in the LEXs.

In addition to that there are other differences resulting from the theoretical model used for the dimensioning:

- Each ATM node is supposed to be connected with the two AGEs within the same *access area.* In practice that is not always the case.
- The two AGEs in each *access area* are assumed to be interlinked directly. In practice that is not always the case.
- No account is taken of ATM nodes to which no DSLAMs are connected and which are no AGE. Today there are still a number of locations where this is the case, but these will be disappear from the network in the course of the year.

2. INTERMEDIATE RESULTS

2.1. *DSLAM-EQUIPMENT PER NODE*

2.1.1 PRINCIPLE

The model used provides for a dimensioning *per individual DSLAM location.* The Institute thinks this approach advisable because the specific nature of DSLAMs, the capacity of which is extended in certain minimum steps, entails that using an average number of users per location does not necessarily lead to a representative dimensioning.

2.1.2 ELABORATION

2.1.2.a CHOICE OF THE EQUIPMENT

The type of DSLAM taken into account in the model is the Release 4bis (with a maximum of 768 users per rack), which corresponds with the Modern Equivalent Asset (MEA) of all types of equipment now used by Belgacom (cf paragraph 4.1.1).

It should be noted that despite this choice the model provides for the possibility of performing a dimensioning with several types of DSLAM. This allows for instance for a scenario to be elaborated in which account is taken of the historical evolution of the DSLAM infrastructure[4] or which takes into consideration the introduction of technologies that require new types of DSLAM.

2.1.2.b DIMENSIONING RULES

For each DSLAM location an estimation has been made of the total number of end-users (per type) that will be connected by the middle of the year in which the tariffs will be applied (the year of reference).

These numbers have been determined by the Institute based on detailed information for each DSLAM location, provided by Belgacom and taking into account the forecast information provided by Belgacom and the alternative operators at the request of the Institute (cf paragraph 1.1).

Treatment of the granularity of the equipment

The number of users determines the necessary number of line cards which in turn determine the number of racks or subracks as well as the cabling needed. Considering the maximum number of racks per DSLAM, this results in the number of DSLAMs, the number of network interfaces and the number of extender cards.

Because of the nature of the DSLAMs and the installation cost and other operational aspects involved it is not efficient to extend the configuration per individual line card. That is why the model assumes that the configurations are enlarged or completed with extensions of a certain size.

That size will be determined for each type of DSLAM, but the Institute currently reckons with an extension of 384 users, which amounts to an entire rack in case of a Release 4 DSLAM and a complete subrack in case of a Release 4bis DSLAM, as used by the SMP.

The assumption is that each extension will be fully configured with line cards, taking into account the expected numbers of users per type of line card.

Evaluation of the efficiency of the dimensioning

Both Belgacom and the OLOs have stated in their answers to the consultations that in practice the DSLAMs are not dimensioned in that way. The Institute agrees but still wishes to maintain the approach described above. Indeed, because of many factors

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[4] Based on that scenario it was possible to observe that the inventory of components of certain DSLAM Releases, communicated by Belgacom was overestimated. By comparing the volumes indicated by Belgacom with the results of the corresponding scenario in the theoretical BIPT model, it became clear that about 15 % of Belgacom's inventory for the Release 3 consisted of assets that were no longer in use.

the theoretically most efficient configuration can never be reached not even by an efficient operator.

Current examples of such factors are the obligations regarding guaranteed positions for the OLOs, but also things like the move of installations, migration to a more recent type of DSLAM, non-availability of certain components, etc. play a role.

The impact of all these factors is hard to evaluate realistically and also difficult to implement in a theoretical model. Therefore the Institute prefers to apply a dimensioning that leaves a certain margin, thus indirectly taking into account such factors.

This was also verified by performing a dimensioning with all the types of DSLAM used by Belgacom, which therefore results in a theoretical configuration that corresponds as closely as possible with the real physical situation. Those results clearly showed that the model does not lead to an excessive overdimensioning.

In a scenario with only one type of DSLAM, as is currently the case for the tariff determination, the dimensioning is done as follows:

- the number of users determines the minimum number of line cards.
- the sum of all line cards determines the theoretical number of extensions of the configuration.
- the card positions still unoccupied in the last extension are then distributed in proportion to the number of users per type, to arrive at the fully configurated extensions.
- the number of extensions determines the number of racks and the number of DSLAMs. The operational practice of Belgacom is taken into account as for the maximum size of DSLAM configurations.

Overcapacity

By definition the dimensioning described above results in a certain degree of overcapacity. This is completely normal since economically it is more interesting not to execute the installations for each individual component. Additionally this also means that new customers can be connected quickly.

That advantage is lost however, when the configured positions are occupied almost completely. Therefore, in such a situation, an efficient operator will decide to configure another extension.

The model allows for that possibility and therefore an extra extension is configured, when the number of free positions in the extension last dimensioned is lower than a specific reference value.

That reference value is determined as follows:

$$value = users * growth / 365 * delay * peakfactor$$

users : number of users at the DSLAM location
growth: expected market growth in percentage

delay: period (in days) needed to install a new extension

peakfactor: increase in order to take into account the non-uniform distribution of demand (average number of new users and spread as to user type)

For the dimensioning of the DSLAM environment the Institute used the following values:

- *users*: as estimated by the Institute for the middle of 2007
- *growth*: 5 % (result of the 2007 forecast)
- *delay*: 120 (the Institute's own estimation)
- *peakfactor*: 2 (the Institute's own estimation)

In the dimensioning described above the positions on the cards are assumed to be occupied sequentially and to also remain occupied. This approach is too optimistic because in practice there will always be situations in which positions become available that are not immediately occupied by a new customer.

Therefore the model reckons with a certain underoccupation of the positions used on the cards, also on the DSLAMs that are fully occupied in principle.

The Institute estimates that number at 0.5 % of the available number of positions. For that it bases itself on the fill rate of the ADSL line cards on the Release 3 DSLAMs, as communicated before by Belgacom.

2.2. *DSLAM-ATM LINKS*

2.2.1 PRINCIPLE

Just like the dimensioning of the DSLAMs the links between the DSLAMs and the ATM nodes are modeled on an individual basis. This means that for each link the capacity, length and location are charted.

2.2.2 ELABORATION

For each configurated DSLAM always one STM-1 network link is dimensioned. The Institute wishes to point out that this actually involves all configured DSLAMs, so also those on which no positions have been occupied yet.

For a number of locations such capacity is not necessary, but the smaller network connections are not more cost-effective. Network connections of bigger capacity (STM-4, STM-16) do not apply either, because the current bandwidth per user, combined with the maximum size of the DSLAM configurations, does not require such capacity.

De above-mentioned dimensioning of the links between the DSLAMs and the ATM nodes can therefore be regarded as the most efficient technical configuration.

The type of network link combined with the location of both extremities and the distance in between constitute on an individual basis the input variables for the calculation of the costs based on the backhaul tariffs.[5]

2.3. *ATM NETWORK*

2.3.1 PRINCIPLE

Again when making the inventory each of the individual ATM nodes is considered separately. As a consequence the ATM switches are dimensioned based on the DSLAM equipment directly connected to them on the one hand and based on the mutual connections to the other ATM nodes or to the OLO network on the other hand. Finally, a distinction is also made between a situation where the OLO is connected to each ATM node (local access) and a situation where that is not the case (non local access).

2.3.2 ELABORATION

2.3.2.a DIMENSIONING OF THE COMPONENTS ON THE PARENT AND THE DISTANT ATM NODES AND CONVEYANCE BETWEEN THE ATM NODES (NON-LOCAL ACCESS)

The following graph gives a view of the components that play a role in dimensioning (*local access* scenario).

Only the components regarded as the main cost centres are involved. A number of other physical components (OMDFs, ESDFs, cabling, racks...) are determined based on the main components dimensioned.

On the ATM switch itself the ports, depending on their specific function, are divided as follows:

- ATM access port : incoming port for the links with the DSLAMs;
- ATM backbone port : outgoing port for the links with other ATM nodes;
- ATM network port : outgoing port for the link to the OLO.

[5] The distance taken into account (as the crow flies, real distance) corresponds with the tariff structure of the backhaul tariffs.

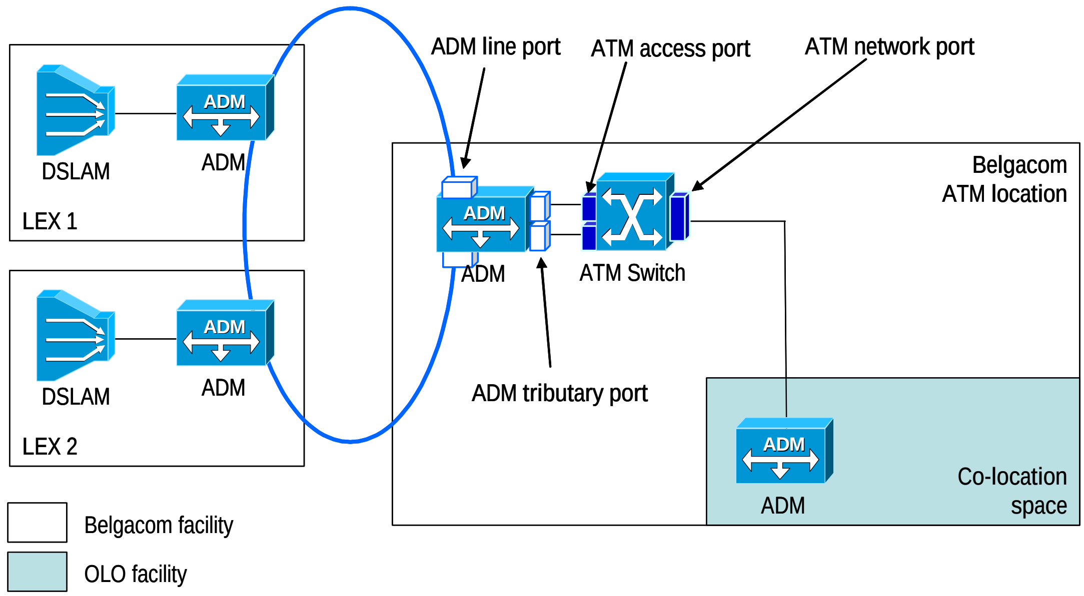

Figure 4: survey of the components that are important in dimensioning the components in the situation where the OLO is connected to each ATM node (local access scenario)

As represented schematically, the following components need to be taken into account on the *parent ATM node:*

- the costs related to the ADM components for the incoming links from the DSLAMs are part of the backhaul tariffs. These components are therefore not included in the dimensioning. Of course these incoming links are of interest for dimensioning the ATM components.
- the links between the ADM and the ATM access ports and the ATM access ports themselves.
- the actual ATM switch(es).
- the ATM network port(s) and the outgoing link towards the OLO.

Dimensioning rules

When dimensioning the *local access* scenario all data are supposed to transit only through the *parent ATM node*.

The basic dimensioning is done as follows (per ATM node):

- The dimensioned links between the DSLAMs and the ATM node concerned determine the number and the type of the ATM *access ports* op de *parent ATM node.*
- Depending on the aggregated incoming bandwidth one or more *network* ports are dimensioned to handle this bandwidth. This simulates in fact a scenario where a single operator (e.g. the incumbent operator) would take the entire bandwidth It should be noted that this aggregated bandwidth does not represent the

theoretical capacity of the configured STM-1 links, but that of the actual users connected.

- In addition, a number (6) of lower capacity *network ports* are dimensioned, in order to simulate the OLOs' access points. The number of 6 *network ports* has been chosen because, combined with the number of ATM nodes, this more or less corresponds with the total number of OLO *network ports* in the current network of Belgacom.
- The dimensioned *ATM access ports* and *ATM network ports* determine the number of I/O cards and/or line cards. Taking into account the physical limitations of the switch, this determines the number of switches needed per location.
- If several switches are needed at one and the same location, extra links are dimensioned between the switches themselves, the capacity of which is equal to the aggregated incoming bandwidth on the ATM node, divided by the number of configurated switches.
- The other components (cabling, distribution frames, etc.) are determined based on the numbers dimensioned above and the corresponding capacity (e.g. the maximum number of positions).

The purpose of this dimensioning, including the *network ports* for the incumbent is to have a realistic dimensioning of the actual ATM switch(es). However, these *network ports* for the incumbent are not included in the calculation of the "common" costs.

Indeed, in principle, all other components can be considered to be common components not specifically attributed to one specific operator.

2.3.2.b Dimensioning of the components on the parent and distant ATM nodes and conveyance between the ATM nodes (non-local access)

Similarly the following graph gives a view of the components that play a role in dimensioning in the *non-local access* scenario.

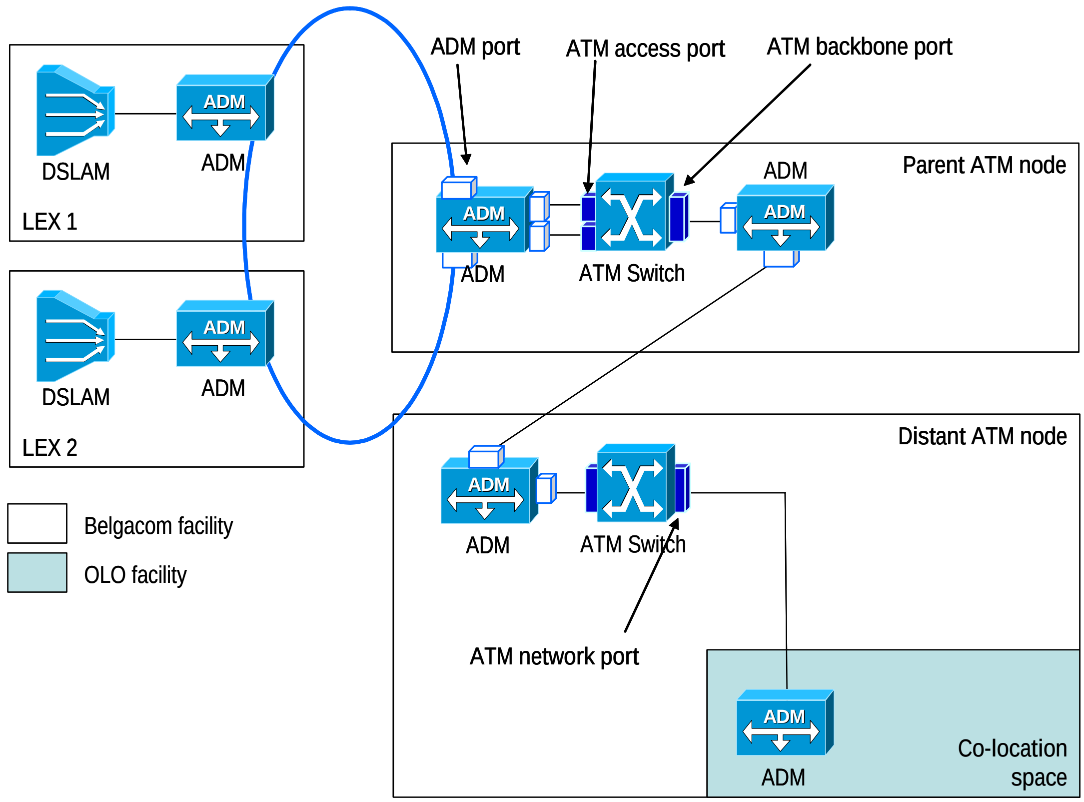

Figure 5: survey of the components that are important in dimensioning the components in the situation where the OLO is not connected to each ATM node (non-local access scenario)

As represented schematically, the following components need to be taken into account:

- The costs for the ADM components for the links coming in from the DSLAMs on the *parent ATM node* are, just like the previous scenario, included in the backhaul tariffs and therefore there is no dimensioning. Of course these links do have an impact on the dimensioning of the ATM components.
- The links between the ADM and the ATM access ports and the ATM access ports themselves on the *parent ATM node*.
- The ATM switch(es) on the *parent ATM node*.
- The ATM backbone port(s) and the outgoing link(s) to the ADM(s) that form the link(s) with the *distant ATM node*.
- The costs of these outgoing ADMs and the ADM components for the incoming links on the *distant ATM node* are part of the backhaul tariffs. Therefore the dimensioning of these components is limited to determining the bandwidths needed and the distances involved.
- Depending on the bandwidth needed, one or more ADM-ATM switch connections.
- The ATM switch(es) on the *distant ATM node*.
- The ATM network port and the outgoing link towards the OLO.

Dimensioning rules

When dimensioning the *non-local access* scenario the *parent ATM node* is considered to be linked to the two AGEs within the same *access area*. Therefore all data transit through the *parent ATM node* and through both AGEs functioning as *distant ATM nodes*.

The basic dimensioning for the *parent ATM node* is by and large done the same way as for the *local access* scenario:

- The dimensioned links between the DSLAMs and the ATM node concerned again determine the number and the type of the ATM *access ports* op de *parent ATM node.*
- Depending on the aggregated incoming bandwidth, for each AGE one or more *backbone ports* are dimensioned for an IAA link to the AGE in order to handle each time this full bandwidth. This way there is a guarantee that the full bandwidth can always be handled when one of the links breaks down.
- No *network ports* are dimensioned.
- Based on the number of ports above the rest of the dimensioning of the ATM node is then performed as described for *local access.*

On the AGE nodes the dimensioning is done as follows:

- The dimensioned links between the DSLAMs directly connected to the AGE node involved again determine the number and type of the ATM *access ports*.
- Depending on the IAA links dimensioned earlier between the *parent ATM node(s)* and the AGE involved, a number of extra ATM *backbone ports* are dimensioned to support these IAA links.
- Between the AGE node and the corresponding AGE node within the same *access area* one or more inter-AGE links are dimensioned to support a bandwidth equal to the maximum of the aggregated bandwidth (DSLAMs plus IAA-links) arriving on one of the two AGEs.
- Just as in the case of local access one or more *network ports* are dimensioned for outgoing links in order to handle the total aggregated bandwidth on the AGE (DSLAMs, IAA-links and inter-AGE links) and to simulate the OLOs' access points. As for the latter in this scenario account is taken of 15 access points per AGE, which therefore again amounts to about the total number of OLO access points in the current network.
- Once the necessary number of *ATM access ports* and *ATM network ports* has been determined, the rest of the dimensioning is done as described in the case of *local access.*

This is represented schematically in the graph below.

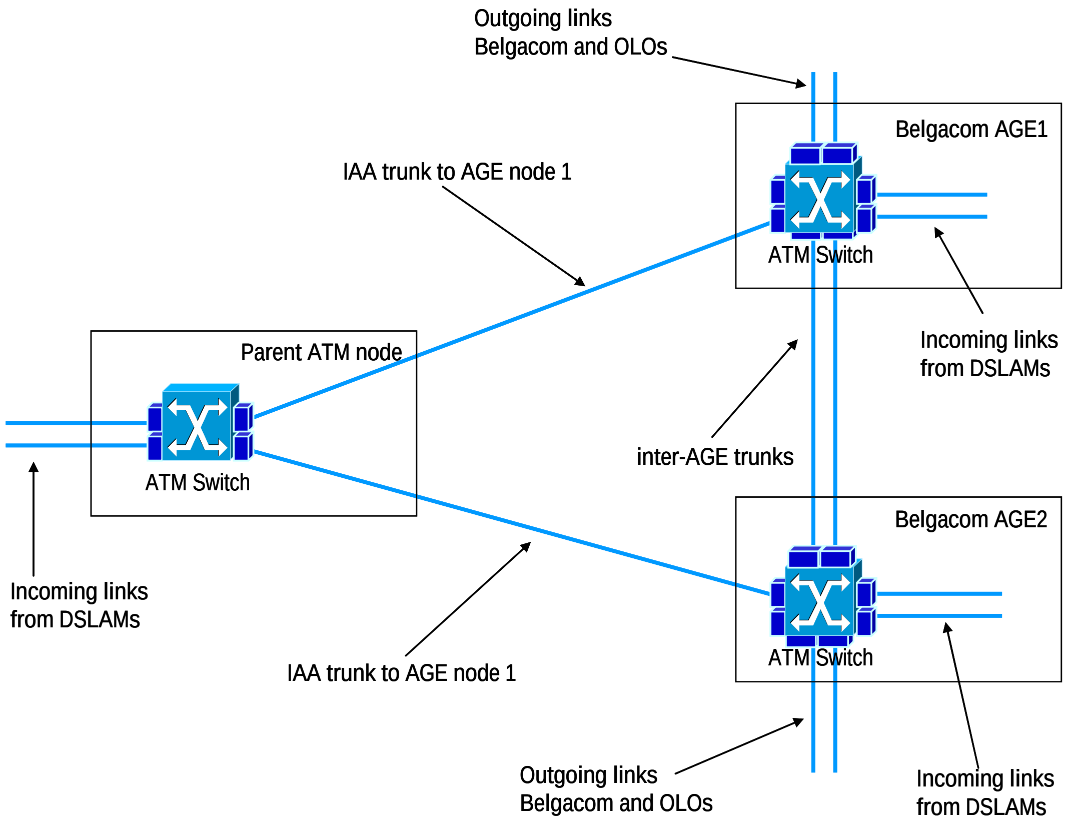

Figure 3: Diagram of the dimensioning in the situation where the OLO is not connected to each ATM node (non-local access scenario)

Overcapacity

The nature of this dimensioning and the *"footprint"* of the dimensioned components automatically results in some degree of overcapacity. Extra measures are therefore unnecessary.

3. FINAL RESULTS: OUTPUT OF THE INVENTORY EXERCISE

The output of the inventory exercise consists of a volume of DSLAM equipment, the components of the ATM network (ATM equipment and a volume of links between the ATM nodes) and also the links between the DSLAMs and the ATM-nodes.

The list of the various components dimensioned in the bottom-up model and the volumes for each of those components are discussed in detail in the following paragraphs.

3.1. *TOTAL VOLUME OF DSLAM EQUIPMENT*

In the figure below the list is given of the various components dimensioned separately in the model which make up the total inventory as far as DSLAM equipment is concerned:

	modeled quantity	fill rate/ racks with
R4bis DSLAM configurations		
linecards PSTN	60.695	85,39%
linecards ISDN	6.692	79,31%
linecards ADSL2+	0	N/A
linecards SDSL	1.446	52,78%
increments	4.305	0,00%
racks	2.410	89,25%
cabling	4.305	N/A
STM-1	1.508	62,57%
extender cards	902	37,43%
power installation requirement (A)	120.500	N/A

Figure 6: survey inventory of DSLAM equipment

3.2. *TOTAL VOLUME OF DSLAM-ATM LINKS*

LEX/LDC	Parent LEX	# STM-1	# increments	Parent ATM node	phoenix	backhaul	distance
02ALS0000	02ALS0000	3	10	02STR0	Z1Z1S	age to lex	11,92
02AND0000	02AND0000	6	23	02STR0	Z1Z1S	age to lex	2,93
02AND0499	02AND0000	1	2	02STR0	Z1Z1S	age to olo	4,89
02AND0398	02AND0000	1	1	02STR0	Z1Z1S	age to olo	6,44
02ASS0000	02ASS0000	2	8	02MAR0	Z1Z1S	age to lex	12,10
02ASS0098	02ASS0000	1	1	02MAR0	Z1Z1S	age to olo	14,63
02ASS0097	02ASS0000	1	1	02MAR0	Z1Z1S	age to olo	16,09
02BER0199	02BER0000	1	1	02MAR0	Z1Z1S	age to olo	3,93
02BER0000	02BER0000	5	19	02MAR0	Z1Z1S	age to lex	5,44
02BOS0000	02BOS0000	7	25	02STR0	Z1Z1S	age to lex	5,65
02BOS0399	02BOS0000	1	3	02STR0	Z1Z1S	age to olo	5,30
02BOS0299	02BOS0000	1	2	02STR0	Z1Z1S	age to olo	6,81
02BOS0099	02BOS0000	1	2	02STR0	Z1Z1S	age to olo	6,28
02BRA0000	02BRA0000	4	15	02STR0	Z1Z1S	age to lex	17,66
02BRA0399	02BRA0000	1	3	02STR0	Z1Z1S	age to olo	19,38
02BRA0099	02BRA0000	1	2	02STR0	Z1Z1S	age to olo	16,30
02BRA0098	02BRA0000	1	1	02STR0	Z1Z1S	age to olo	15,94
02BRC0000	02BRC0000	2	7	02STR0	Z1Z1S	age to lex	18,76
02CEN0000	02CEN0000	3	11	02MAR0	Z1Z1S	age to lex	4,77
02CEN0099	02CEN0000	1	2	02MAR0	Z1Z1S	age to olo	5,36

Figure 7: survey inventory of links between the DSLAMs and the ATM nodes (extract)

3.3. *TOTAL VOLUME OF ATM EQUIPMENT*

As for the inventory of ATM equipment a distinction can be made between the equipment inside the ATM nodes and the links between the various nodes.

Product	Product code	Description	Scenario 7670 Local #	7670 Non-local #
7670 switches				
Switching / Peripheric shelf 7670	90-6699-01	SINGLE SHELF clei	46	47
50G_CTL	90-4669-02	CTL CARD-2 +SSU clei	92	94
50G_SW	90-4590-01	SWITCH CARD clei	92	94
CIC_IO	90-6703-01	CTRL INTERCONNECT CARD clei	92	94
FAC_IO	90-7039-02	FACILITIES CARD-INTERNATIONAL	46	47
HS_MULTIRATE_LINE	90-6704-02	MULTI-RATE8 SONET/SDH ATM/IP L.CARD clei	136	151
HIGHBW_LINE	90-7572-01	MULTI-RATE16 SONET/SDH LINE CARD clei	0	132
HS_STM1_IO	90-7569-02	8P OC-3C/STM-1 IR I/O CARD clei	247	238
HS_STM4_IO	90-7570-02	2P OC12C/STM4 IR I/O CARD clei	0	36
STM16_IO	90-7041-01	OC48C/STM16C NNI clei	0	132

Figure 8: survey inventory of ATM equipment

Node A	Node B	Backhaul	# IAA links	Speed
LEX to AGE links				
02LIN0	02MAR0	age to lex	1	STM-16
10WAV0	81MAH0	age to lex	1	STM-16
13DIE0	11HAS0	age to lex	1	STM-4
14HER0	11HAS0	age to lex	1	STM-16
15MES0	11HAS0	age to lex	1	STM-16
19WAR0	41LGE0	age to lex	1	STM-4
51ROE0	50ASS0	age to lex	1	STM-16
52DEN0	91GEN0	age to lex	1	STM-16
53AAL0	91GEN0	age to lex	1	STM-4
54NIN0	91GEN0	age to lex	1	STM-4
55RON0	91GEN0	age to lex	1	STM-4
57IEP0	50ASS0	age to lex	1	STM-4
58VEU0	50ASS0	age to lex	1	STM-4
59OOS0	50ASS0	age to lex	1	STM-4
60CHI0	65MON0	age to lex	1	STM-4
61LIB0	81MAH0	age to lex	1	STM-16

Figure 9: survey inventory of links between ATM nodes (extract)

PART 2: DESCRIPTION OF THE STRUCTURE OF THE COST MODEL AND THE CHOICE OF THE VARIOUS PARAMETERS, DEDUCTION OF THE TARIFFS

Based on the inventory made as described in PART 1 the next step consisted of establishing the actual cost model. This model consists of various modules that correspond with the aggregated building blocks of the specific network for the provision of broadband services:

- Module 1: DSLAM equipment
- Module 2: DSLAM-ATM links
- Module 3: ATM network (switches and links between the ATM switches)

The costs of Module 1 and 2 together form the basis for determining the BROBA specific part of the end-user line. The cost of the ATM transport is deduced from Module 3. The various modules are discussed in the chapters below. The final chapter details the integration of the cost components into the tariff structure which can be found in the BROBA offer.

4. MODULE 1: DSLAM EQUIPMENT

The figure below represents the various steps in deducing a unit cost for DSLAM equipment per end-user line:

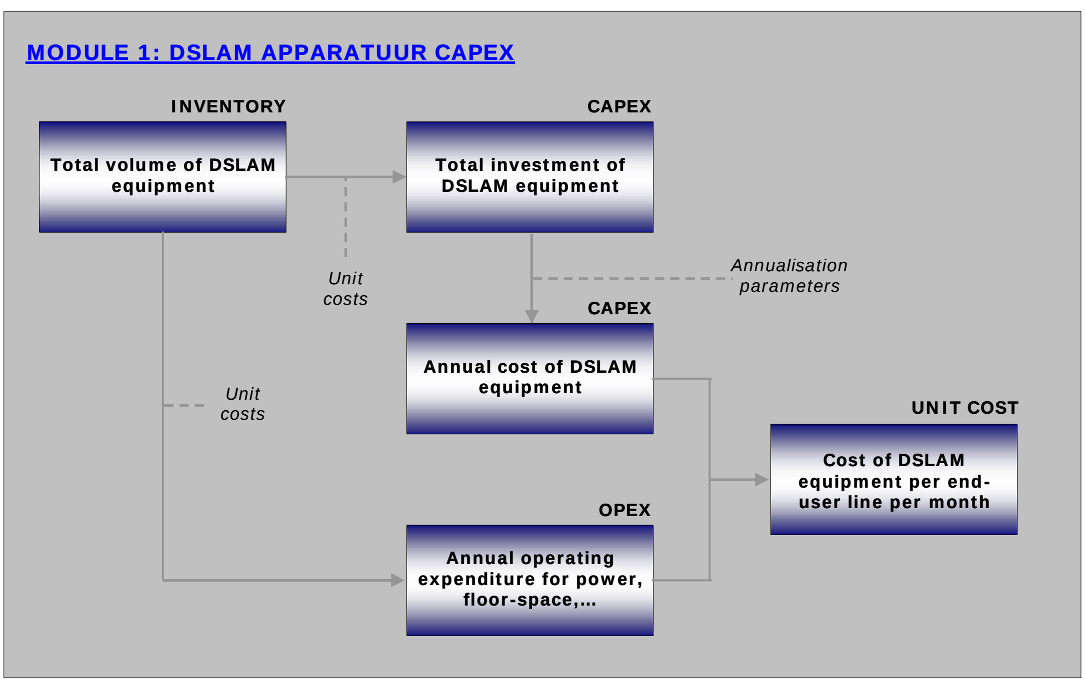

Figure 10: survey of the subsequent steps in deducing the unit cost for DSLAM equipment

4.1. *DETERMINATION OF THE INVESTMENTS*

Total investment in DSLAM equipment is determined first of all by multiplying the various components in the inventory by the current unit prices. The result is total investment in hardware. Apart from the cost of the actual DSLAM equipment, the cost of installation and various support activities (engineering, synchronisation, …) are also added. Indeed, these costs will be activated together with the total investments and spread over the life span of the equipment by means of depreciations.

4.1.1 VALUATION OF THE ASSETS

4.1.1.a PRINCIPLE

As for the valuation of the assets the Institute thinks a valuation based on current cost is the best reflection of efficient costs.

Moreover it should be noted that all assets from the efficient inventory are taken into account.
This is also consistent with the CCA approach for the core network when fixing the interconnection rates.

The Institute finds this advisable because an approach based on excluding fully depreciated assets, but in still use, from the cost, combined with a current cost approach, would put the investment risk too much on the shoulders of the SMP and take away any stimuli for proper investments for OLOs.

4.1.1.b ELABORATION

For defining the current cost the price of the Modern Equivalent Assets (MEAs) has been taken into account. These prices have been communicated by Belgacom and include the volume discounts Belgacom gets from its suppliers. It should be noted that these MEAs were also taken into account by BIPT when modeling the efficient inventory.

In principle their *current cost* can be determined based on the average cost per user of an MEA *(Modern Equivalent Asset)*, but the Institute does not favour such a straightforward approach. Indeed, such a proportionate approach does not sufficiently take into consideration the physical and operational differences of the various types of equipment (minimal extensions and such).

That is why the Institute has opted to have a modeling based on the use of Release 4bis DSLAMs. That way the average cost per MEA user is actually taken into account in the model, while taking any limitations of such equipment into consideration, such as the bigger *"footprint",* which may cause that type of DSLAM to be less cost-effective on locations where there are few users.

As to the exact choice of the MEA it was already indicated in paragraph 1.3.1 that BIPT thinks a reasonable approach of an LRAIC approach is appropriate. This is also made concrete by taking into account certain historical choices made by the incumbents regarding DSLAM equipment, especially the ASAM DSLAMs of Alcatel. As a consequence the choice of *the kind* of equipment (e.g. DSLAM equipment instead of *'multi-service'* equipment) will not be changed. As for *the type* (i.e. *'the*

Release') BIPT has opted to only consider the most recent relevant type. Concretely this means the Release 4 bis DSLAM. BIPT is fully aware of the fact that today more recent types of DSLAM are available, but it thinks that those are not more cost-effective for the broadband services included in the BROBA offer.

4.1.2 SEPARATE COMPONENTS

Total investment consists of hardware, installation costs and support costs. The detailed components distinguished when fixing each of these partial investments, are represented in the table below.

Hardware investments	Installation costs	Support costs
linecards PSTN	Project Management Cost	Powering Cost per Ampère
linecards ISDN	Site survey cost (per rack)	Additional planning cost
linecards ADSL2+	Installation cost of rack on raised floor	Additional Engineering Costs
linecards SDSL	Installation cost of extender card cabling	Additional provisioning, maintenance & construction costs
racks	Installation cost of distribution frame	Synchronisation costs
cabling	Installation cost of cable support system	Surge protection investment cost
STM-1	Investment cost of cable support system	Other additional costs
extender cards	Time Cost for movement (BGC Only)	
	Champ connectors 50 pin	

Figure 11: Survey of the detailed cost components for fixing total investment in DSLAM equipment.

As can be seen, where relevant, a distinction is made between the specific components for PSTN/ISDN and ADSL(2+)/SDSL.

4.2. *DEDUCTION OF THE ANNUAL AND MONTHLY COST*

In order to deduce the monthly tariffs for BROBA services the total depreciations need to be reduced to a monthly cost. This is done by first reducing the amount to an annual basis based on depreciations (incl. counting the cost of capital). This amount is then reduced to a monthly amount by dividing it by 12.

4.2.1 DEPRECIATIONS

Given an amount of investments the level of the depreciations is then determined by means of the depreciation *method* on the one hand and the depreciation *period* on the other. Depending on the depreciation method chosen the annual price evolution may also be a parameter.

4.2.1.a DEPRECIATION METHOD

BIPT has opted for a system of economic depreciation elaborated on the basis of the *'Tilted Annuity Method'('TAM-depreciation)*. This method has been used before by BIPT for fixing the interconnection rates. Indeed, BIPT is convinced that this depreciation method gives the best signals to the sector since it gives an estimation of the real costs currently linked to the investments involved, which are more realistic than what results from the "historical" accounting. The method chosen also makes it possible to take account of important price evolutions (cf paragraph 4.2.1.c).

4.2.1.b DEPRECIATION PERIOD

The depreciation period taken for elaborating the '*TAM-depreciations*' is an estimation of the economic life of the assets. As to the precise period the Institute maintains its former approach of depreciating the DSLAMs over a 5 year period. The Institute considers this to be a right balance between the depreciation period as applied in accounting (which is probably shorter) on the one hand and the real (technical) life that can be observed for certain types of assets (in the meantime clearly more than 5 years).

4.2.1.c ANNUAL PRICE EVOLUTION

The Institute takes into account an annual price change of DSLAM equipment of -5%. It should be noted that this price change cannot be seen separately from the inclusion of the MEA in determining efficient investments. In other words the annual price evolution gives an indication of the expectations regarding prices of the same type of DSLAM. In fact, if a price evolution were considered for the various types already in use since the offer of the first broadband products, average annual price changes can be set that are much higher. As these are strongly related to the change to new types of DSLAM they cannot be considered as relevant in combination with the choice for an MEA.

Finally, it should be noted that these price evolutions have only been included for hardware investments. The investments regarding installation and support cost have a price change equal to 0%.

4.2.2 COST OF CAPITAL

In its calculations the Institute has taken a WACC of 11.44% in accordance with the Council Decision on the 2007 WACC[6].

4.2.3 OPERATING EXPENDITURE

Once the investments have been reduced to monthly costs, they have to be increased by the operating expenditure (OPEX) for the period concerned. The OPEX categories quantified individually are shown in the figure below.

Operating expenditure
Monthly maintenance cost per rack
Monthly maintenance cost per network interface card
Monthly maintenance cost per line card ADSL
Monthly maintenance cost per line card ADSL2+
Monthly maintenance cost per line card SDSL
Yearly repair cost per rack
Yearly insurance fee per rack
Floor space cost per m² incl. airco, cleaning
Yearly dust filter replacement cost
Yearly power consumption cost per Ampère

[6] Cf Council Decision of XX/XX/XX on the 2007 WACC.

Figure 12: List of individual cost components for determining the OPEX for DSLAMs

In this case also, where relevant, a distinction is made between the specific components for PSTN/ISDN and ADSL(2+)/SDSL.

4.3. *FIXING THE UNIT COST*

The last step is to distribute the total cost on a monthly basis among the total service volume. To do so a distinction is made between the various services. The denominator dividing the total monthly cost corresponds with demand in the middle of 2007. That demand is considered by BIPT to be the best average estimation possible for the entire year of 2007. The result is a cost per end-user line per month.

5. MODULE 2: DSLAM-ATM LINKS

The second module fixes the cost of the link between the DSLAMs and the *'parent ATM'*. As before, these links are valuated based on the backhaul tariffs. This means that a total annual and therefore monthly cost can immediately be deduced, which includes both capital and operational expenditure.

Since the backhaul tariffs do not contain any costs related to ports on ATM switches, the cost of the STM-1 port on the *'parent ATM'* (switching) is also added to the cost of the actual link (transmission). That cost is deduced in Module 3 and is considered as input in Module 2.

The sum of the total transmission and switching costs related to the DSLAM-ATM links is finally distributed among the same volumes that were used in Module 1, to obtain a cost per end-user line per line (cf paragraph 4.3).

6. MODULE 3: ATM NETWORK

The ATM network can be divided into the ATM switches on the one hand and the links between the nodes on the other hand.

As to the switching part, the costs of the ATM switches are determined in a manner very similar to the approach explained in Module 1 for the DSLAM equipment. The transmission part however closely resembles the approach followed fo links between the DSLAMs and the *'parent ATM'*.

The following paragraphs will therefore mainly focus on the specific elements of the ATM network.

6.1. *DETERMINATION OF THE INVESTMENTS IN ATM SWITCHES*

Apart from hardware also costs regarding installation, licence fees and network management were included into the total investment. The figure below shows the level of specification in this matter.

Hardware investments	Installation costs
Switching / Peripheric shelf 7670	Planning
50G_CTL	Engineering
50G_SW	PMC
CIC_IO	Others
FAC_IO	Installation of equipment on floor
HS_MULTIRATE_LINE	Installation and connect cabling OMDF/ESDF
HIGHBW_LINE	Installation cost STM-1, STM-4, STM-16
HS_STM1_IO	Installation Cost E1, E3
HS_STM4_IO	Equipment Cost for cable support system
STM16_IO	Cabling cost OMDF
	Cabling cost ESDF
	Cost of OMDF
	Cost of ESDF
	Install ESDF
	Install OMDF
	Install Cable Support System

Figure 13: Survey of the detailed cost components for fixing total investment in ATM equipment (switching) – Hardware & Installation

6.1.1 VALUATION OF THE ASSETS

For the valuation of the ATM assets the same principles were followed as in the case of the DSLAM equipment (cf 4.1.1).

Regarding the valuation of the assets, the Institute is also of the opinion here that a valuation based on current cost best reflects efficient cost and, as in the case of DSLAMs, has based the dimensioning and cost determination on the most recent technology used by the SMP, namely the Alcatel 7670 ATM switches.

The Institute is aware of the fact that this type of equipment may lead to a certain overdimensioning for certain ATM locations, but thinks that in that way the real economic value of the assets is taken into account in the most appropriate manner.

Belgacom has communicated prices for each of the relevant components.

6.1.2 OPERATING EXPENDITURE

A deduction of the annual cost for investments in ATM equipment does not yet take account of operating expenditure. The following cost categories are distinguished.

Cost category
Management fees
Management of the equipment
Co-location related costs
Floor space (per m²)
Power Consumption Shelves (per A)
Power Consumption Network Management (per A)
Co-location Installation
Manpower costs
Manpower Cost CDS & ANS

Figure 14: List of individual cost components for determining the OPEX for ATM switches

The management fees have been fixed as a percentage of the investments; for the other OPEX costs absolute amounts per unit have been taken.

6.2. *DEDUCTION OF THE ANNUAL AND MONTHLY COST*

6.2.1 ANNUAL AND MONTHLY COST OF THE ATM SWITCHES

The depreciation methods, period and price evolutions taken into consideration by BIPT for the ATM nodes are the same as for the DSLAMs. In other words the depreciation is based on the 'Tilted Annuity Method' over a 5 year period. For the investment in hardware (including the components for network management) a price change of -5% per year is also taken into account.

6.2.2 ANNUAL AND MONTHLY COST OF THE LINKS BETWEEN THE ATM NODES

Just like the link between the DSLAMs and the *'parent ATM'* the volume of links between the ATM nodes is evaluated based on the backhaul tariffs. Therefore, for these components too it is possible to deduce immediately a total annual and monthly cost, which includes both capital and operational expenditure.

6.3. *FIXING THE UNIT COST*

In order to convert these costs into a tariff BIPT has considered the following aspects:

- the tariffs should enable the SMP to recover his costs completely.
- there should be a clear link between the tariff centres and the costs related to them.
- as much as possible a simple tariff structure should be aimed for.

The Institute has evaluated a number of possible approaches and has finally opted for a tariff structure composed as follows:

- a uniform tariff per *end-user line*;
- a tariff per Mbps SCR contracted bandwidth, distinguishing between local and *non-local*;

The concrete realisation of that choice is further explained in the next chapter.

7. Tariff structure

The last chapter in this methodological annex further examines the relation between the various elements of the cost model and the actual tariffs in the BROBA catalogue.

7.1. *Monthly recurring fee*

As for the monthly rental fee for a BROBA line, compared to last year an important change has occurred in fixing the tariff.

Indeed, as already described in this document, the Institute has deemed it advisable not to convert the costs for the network connections between the DSLAMs and the ATM nodes any longer into a tariff per Mbps, but into a tariff per BROBA line. Therefore when judging the tariff proposed, the reader should consider that from now on this tariff covers more costs than before.

For the rest, the monthly recurring fee for a BROBA line is still composed of the BRUO rental fee applicable to a BRUO Shared Pair line on the one hand and of a number of BROBA specific tariff components on the other. The BRUO fees are outside the scope of this document.

7.2. *ATM tariffs*

In paragraph 6.3 the considerations were mentioned which BIPT made for choosing the way in which the costs of the ATM network can be reduced to unit costs. That choice is examined further in the following paragraphs.

7.2.1 Tariff per end-user line

Based on the bottom-up model the Institute was able to observe that the actual bandwidth only has a limited impact on the costs. In fact, the costs of the ATM network are in the first place a result of the number of DSLAMS and their geographical spread.

Indeed, the factors that largely condition the geographical coverage of the ATM network are the limitations regarding the maximum distance of network connections between the DSLAMs and the ATM nodes and the costs associated with that. Once these network variables have been determined, the network costs are hardly subject to change any more. A change of the bandwidth used per user has relatively little impact on this any more.

That is why the Institute does not think it very advisable to convert the ATM costs completely into tariffs per bandwidth. As a result the Institute has opted for attributing the costs of the network connections between the DSLAMs and the ATM nodes, including the line cards and the I/O cards on the ATM node, to the actual factors causing the costs: the DSLAMs or indirectly the number of end-users.

In practice this means that this average cost per end-user is added to the rental fee per BROBA line.

The results of the bottom-up model show that this average cost is marginally different for the *non-local* and the *local* scenarios. This has to do with small differences regarding fill rates of the line cards and I/O cards on the ATM nodes, depending on the scenario. These differences are so small however that the Institute has opted for a uniform cost.

7.2.2 Tariff per Mbps (SCR) contracted capacity

As before, the costs relating to the actual switching equipment and the IAA trunks and the intranode trunks are distributed proportionally based on the total bandwidth of the users connected, expressed in a Mbps SCR value.

In the *local* scenario only the costs relating to the actual switching equipment are taken into account. In the *non-local* scenario both the costs relating to the switching and the backbone links are counted.

The Institute wishes to point out that the results of the model clearly show that the differences in switching costs in either scenario are significantly smaller than the 50 % rule that used to be applied. That assumption therefore proved to be an estimation that was too optimistic. These tariffs are subject to discounts for long-term contracts.

The Institute wishes to point out that these percentages are only applied on the switching cost component. Such a *long-term discount* has already been taken into account for the backbone costs calculated on the basis of the backhaul tariffs.

As for the PCR/SCR values, as in the past, on these tariffs cost percentages are applied that depend on the PCR/SCR value.

The provisions above apply to the VBRnrt quality. For the other types of quality the tariffs are fixed based on the same parameters as currently applied in BROBA 2006.

7.2.3 Tariff per access line

The tariffs above cover all ATM related costs, except for the actual network ports that form the points of connection with the ATM nodes.

These costs are counted in as a fixed cost per connection point and per type of capacity. Since the dimensioning in the model was based on 7670 ATM switches the minimum connection capacity is STM-1. However, in case of a lower contracted bandwidth on the ATM node and in consultation with the OLO Belgacom is free to offer another type of network interface that supports the contracted bandwidth. This must not cause any extra cost for the OLO though.

The bottom-up model leads to differences in cost price between the *non-local* and *local* scenarios, as depending on the scenario, different fill rates of line cards and I/O cards are observed. Those price differences remain relatively limited. That is why the Institute deems it advisable to apply a uniform tariff (per type of interface) in this case too.