# DETAILED VERSION

# Margin squeeze tests for wholesale broadband and next generation leased lines of Proximus and wholesale cable access of Cable operators in Belgium

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# 1 Introduction

Margin squeeze tests (MST) or Economic replicability tests (ERT) in the context of Next Generation Access (NGA) ensure a sufficient margin for alternative providers who rely on wholesale products from the SMP operator, which competes in the same retail market. These tests could be applied ex-ante or ex-post by the national regulatory authority (NRA).

For this purpose the costs and revenues of a hypothetical alternative operator are modelled assuming it replicates the retail product of the SMP operator based on the wholesale service of the SMP operator. The modelled operator is referred to in below text with 'modelled operator' or other licensed operator (OLO) in terms of wholesale costs as this is the name used in reference offers.

WIK Consult (WIK) has been assigned by the Belgium institute for Postal services and Telecommunication (BIPT) to establish a Principle document on margin squeeze testing and margin squeeze tools in relation to:

1. Residential retail broadband Internet access, stand-alone or bundled with IPTV, voice and other services based on shared capacity WBA VDSL2 / Multicast + BROBA;
2. Retail broadband Internet access for small businesses, stand-alone or bundled with IPTV, voice and other services based on shared capacity WBA VDSL2 + BROBA;
3. Analogue or digital TV, stand-alone or bundled with broadband and other services based on wholesale cable access;
4. Retail NGA leased lines.based on Terminating Segments of NGA Leased Lines (BROTSoLL);
5. Business broadband access based on dedicated capacity WBA VDSL2 + BROBA.

This document describes the structure of the designed tools to perform the test, the detailed setup of the various elements and how to use the main functions.
Beside the modelling, WIK also collected data from the relevant SMP operators and a selection of other licensed operators (OLO's) to design and populate the models. The collected confidential data is removed from the public models and manual. This allows the BIPT to consult, if desired, the model itself and the manual without disclosing confidential information.

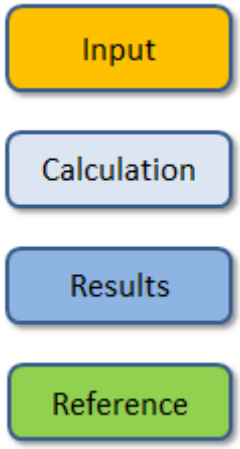
The structure of the document is as follows:

- First chapter 2,3,4,5 and 6 describe respectively the structure and details of the different models;
- Chapter 7 describes how to practically use the models; and
- Chapter 8 addresses remarks with respect to the required data set.

All models are built in Excel and consist of separate (interlinked) spreadsheets (tabs), which correspond with the images in the overviews below.

The color coding in the diagrams in this manual is aligned with the color coding used in the tools and displayed below.

Figure 1: Color coding in diagrams / tool




The fields marked in orange are those where the collected data values need to be inserted. The light and dark blue fields contain calculations but the dark blue fields represent important end results, which are often transferred to other tabs and/or the summary sheet. The green fields contain values which are copied from either input fields or calculation fields to avoid double entries and mistakes.

In the following paragraphs, the different models are set forth sequentially.

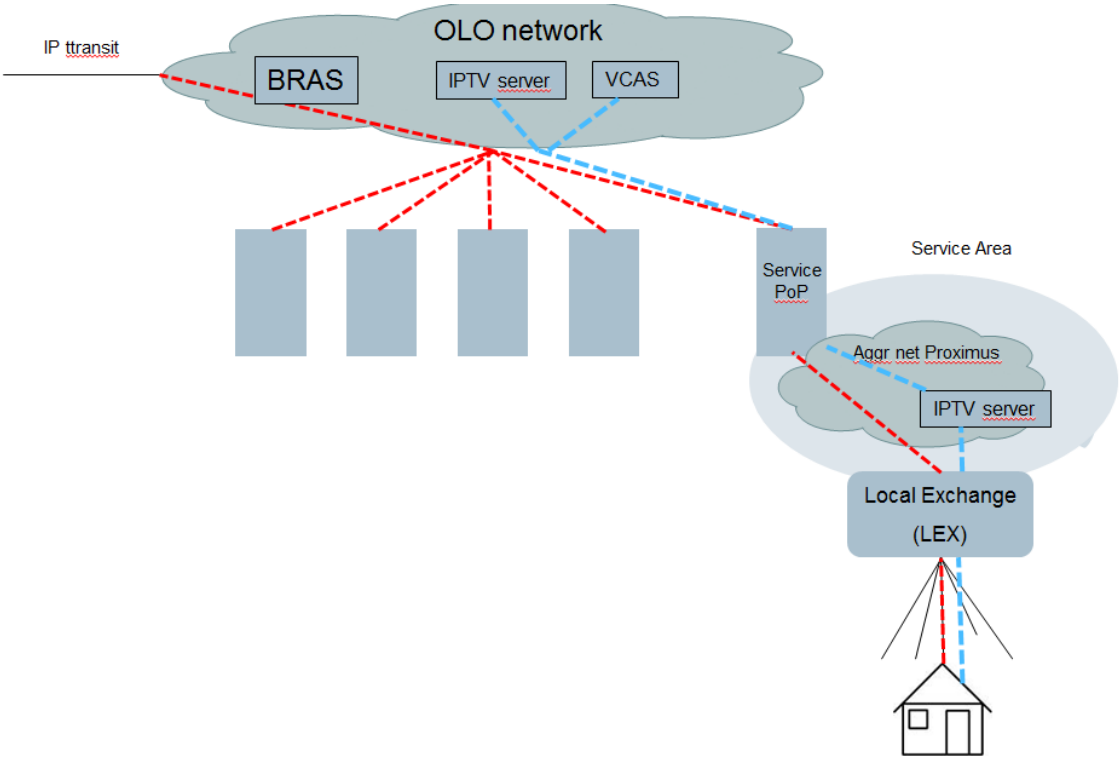
# 2 Model 1: Margin squeeze test for retail products provided to residential customers based on BROBA or WBA VDSL2 (shared VLAN) of Proximus

## 2.1 Overview

This concerns residential broadband packages based on the wholesale services WBA VDSL2 or BROBA (xDSL). In order to reach all connected customers in Belgium, the access seeker needs to connect in 5 hand over points, so called service Points of Presence (POP's) or Points of Interconnection (POI's), one for each regional network area of Proximus.

In the figure below, the broadband connections are displayed in red and the connections for the enabling of IPTV are in blue.

Figure 2 Overview wholesale broadband access of Proximus




Source: WIK

When the OLO orders WBA/BROBA connections for its customers, Proximus provides VLAN connections between the end customer location, the Local Exchange (LEX) and the Service PoI. This could be shared VLAN's for residential customers (model 1) and small business customers (model 2) or dedicated VLAN's for business customers (model 5).

The shared VLAN's are aggregated by Proximus from the Local Exchanges (LEX's) to the Service PoI's if they have the same quality setting. The different quality settings are:

- P=0 (broadband residential)
- P=1 (broadband small business)
- P=3 (video and multicast streams)
- P=5 (voice)

This implies that per Service PoI Proximus hands over a maximum of 4 aggregated shared VLAN's, which are calculated by the tool.

For business customers, in addition to the shared VLAN setup also dedicated VLANs can be configured from the end customer location all the way to the Service PoI.

In the OLO core network, the broadband remote access server (BRAS) arranges the right authorization of internet access profiles. The resulting IP traffic is terminated through an IP transit link to one of the internet exchange points.

## 2.2 Translation to model components

The following figure displays the model components, the second table briefly describes the functions of each component.

Figure 3: Overview of the MST model for residential broadband and/or IPTV based on BROBA/WBA-VDSL2/Multicast

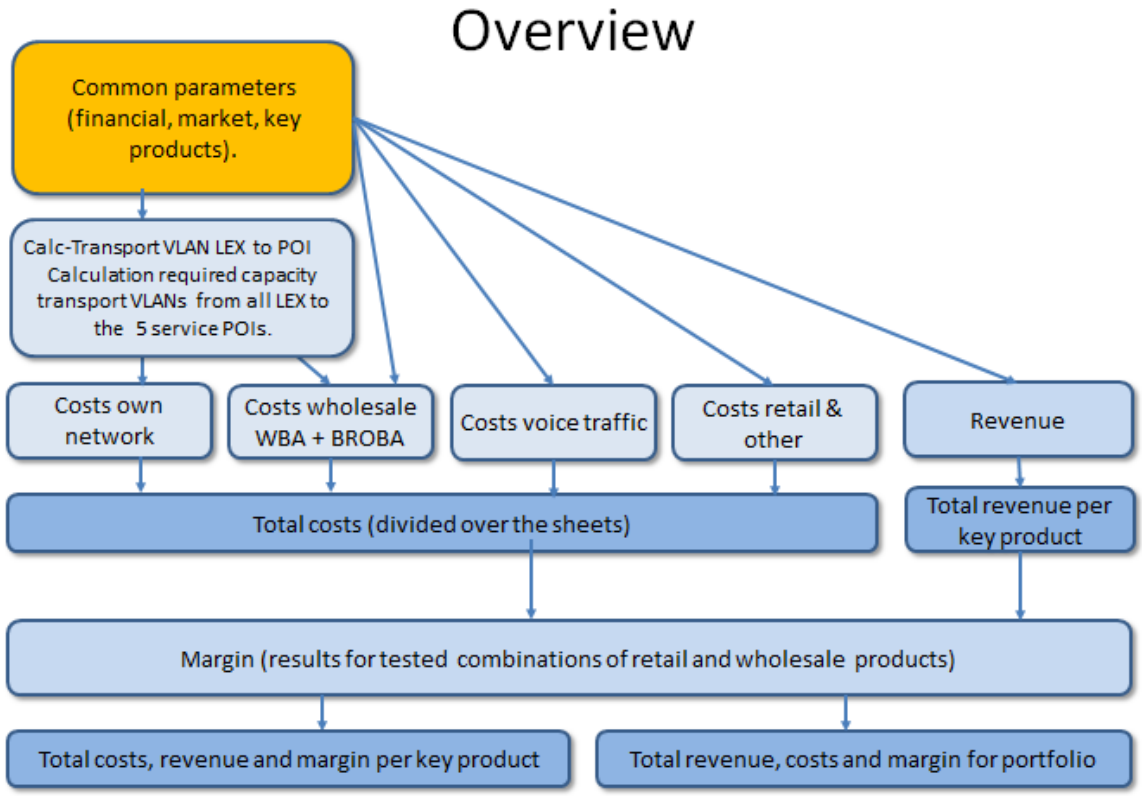


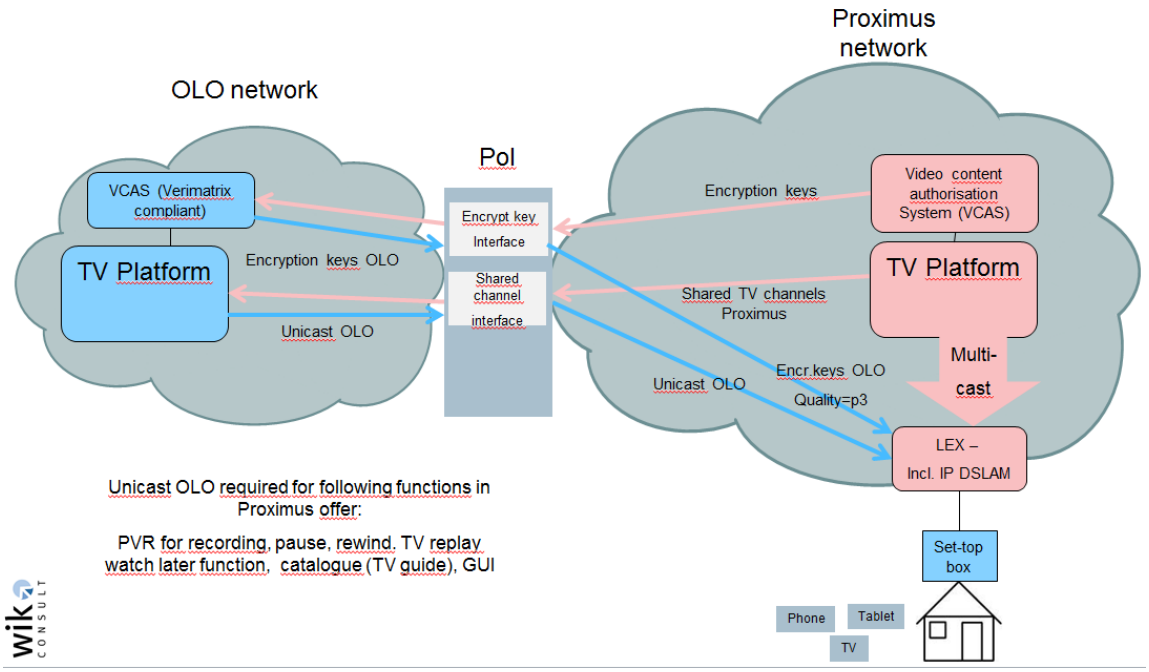
Table 1 Spreadsheets of the MST

| Spreadsheet name | Function |
|---|---|
| Common parameters | Input for the main parameters (WACC, common costs, market share of the modelled operator in homes connected, total available xDSL customers, key product details, dimensioning, price information and regulated voice charges). |
| Margin | Collection of all revenues and costs per key product and for the portfolio of key products based on the WBA, BROBA and multicast wholesale services. Calculation of the resulting margin. |
| Revenue | Input of retail revenue parameters (monthly and one-off retail charges, traffic profiles per flagship product, retail set up and minute prices). Calculation of monthly revenue per subscriber on subscription, voice and IPTV bundles where applicable. |
| Wholesale costs | Input of wholesale charges for WBA, BROBA (monthly and one-off subscriber charges, VLAN transport charges including multicast transport OLO Access Line charges). Calculation of total costs per subscriber and allocation to the key products. |
| Own network costs | Input of core network and transmission costs per Mbps, required costs for the multicast encryptions and IPTV servers and voice server per user, also number and capacity of aggregation links POI to OLO.<br>Calculation of total core network costs, total IP transit costs, and server costs (encryption server Media Gateways and Soft switches). Derivation of costs per subscriber and key product. |
| Voice traffic costs | Input: actual voice minutes, average termination costs on regulated destinations. Calculation of voice termination costs in other networks. The production of voice in the own network is covered by the dimensioning of special vlans with quality setting p=5 under own network costs. |
| Retail and other costs | Input: retail and other costs (regulatory fees, retail order cancellation costs, IPTV content costs and production costs of value added services like 2nd screen, wifi hotspot access etc.). Calculation of retail and other costs per key product. |
| Calculation-transport VLAN (Lex to PoI) | Input: list with the current xDSL lines of Proximus per local exchange area (LEX), additional dimensioning rules for the required VLAN, wholesale tariff scheme of the VLAN transport component.<br>First, calculation of estimated number of customers for the modelled operator per LEX and per key product. Second, calculation of required VLAN capacities according to QoS per LEX from busy hour-demand of key product subscriptions. Derivation of number of VLANS per QoS and per LEX. Third, calculation of VLAN transport costs according to wholesale tariff WBA +BROBA. |

## 2.3 Multicast for WBA VDSL2

In addition to broadband connections, Proximus provides the wholesale multicast functionality, which enables an OLO to offer (a subset of) Proximus TV channels to its customers.

Figure 4 Multicast flows between OLO and Proximus network




The model assumption is that the OLO replicates Proximus' retail offering, so an equal (basic) TV package is modelled out of the available Proximus TV channels. The OLO may decide to add its own TV content to the Proximus TV platform, but that is not relevant in this context as the model tests if the offers of Proximus are replicable.

The OLO needs to get encryption keys from Proximus, which are then distributed by its own Video Content Authorization System (VCAS) server back to the CPE installed at the premises of its own customers. Through the encryption keys, the OLO customers get access to the TV content available.

The connection between the core network of the OLO and the Service POI is called OLO Access Line (OAL). Proximus sets up so called virtual local area network (VLAN) connections between the end customer and the service PoI.

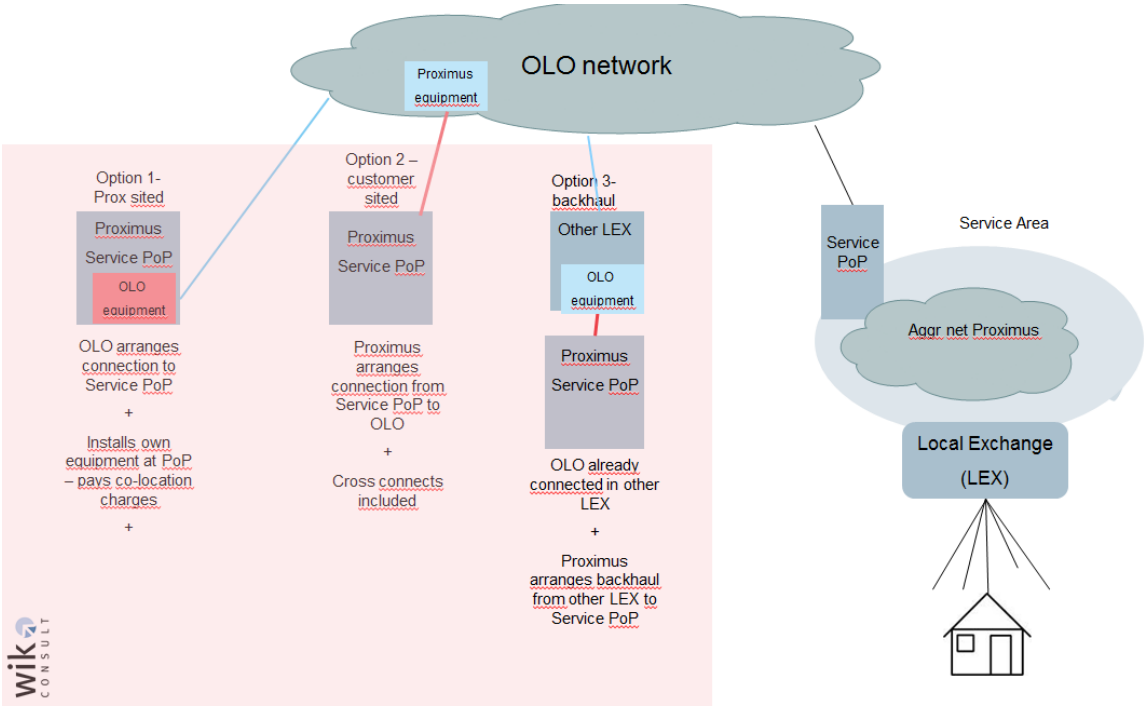
## 2.4 OLO Access line

For the estimation of the costs of the aggregation links between the 5 service PoIs and its own core network, the interconnection scenario is relevant.

For BROBA/WBA VDSL, the OLO operator has three options:

- Proximus sited interconnect
- Customer sited interconnect
- Backhaul interconnect

Figure 5 Interconnection scenarios for OLO Access Line




In the first scenario, the OLO arranges the connection from its core network to the PoI of Proximus, arranges co-location, installs its equipment and coordinates the end to end connection.

The second scenario is that Proximus arranges the connection to the OLO's core network, installs its equipment (at zero costs) at the OLO premises and connects the end to end connection.

In the third scenario, the OLO is already connected to a Local Exchange (LEX) and orders backhaul capacity from Proximus that connects the connected LEX to the PoI for BROBA/WBA VDSL2.

For modelling the OLO Access line, the second option Customer sited interconnect is used. This means that Proximus uses its own equipment to establish the connection for the OLO and includes this in the wholesale pricing. Hence no additional equipment considered at this point. However, this OLO access line has one-off setup costs, which are distributed along the estimated lifetime of the setup.

## 2.5 Detailed description of common parameters

The 'Common parameters' sheet contains the input fields for the main parameters (WACC, common costs, share of Proximus available network connections, total connected customers available on Proximus network, key product details, dimensioning, price information and regulated voice charges.

These main parameters are used in multiple sheets, which ensures consistency and prevents mistakes. This approach also enables the user to quickly change certain essential parameters and assess the impact on the end results.

### 2.5.1 Model type and Estimated number of xDSL based business customers

For model 1, the model type is 'residential' (res). This field drives the calculation of available connections in the tab 'Calc-transport VLAN to PoI'. This tab contains input columns for the number of residential and business DSL connections for each of the roughly 590 local exchanges.

For model 1, the calculation uses the available connections in the residential column (D) multiplied by the set marketshare.

### 2.5.2 WACC and applied capital cost factor

As the model is a static steady state model[1], one-off revenues, charges, costs or investments need to:

- be spread over the relevant lifetime (customer lifetime or asset lifetime);
- respect capital cost through the applied Weighted Average Cost of Capital (WACC);
- be corrected depending on their moment of occurring, which can be; at the beginning, at the end of the customer lifetime or somewhere in between.

One-off charges at the beginning are put on a „per month" scale by multiplication of the *capital cost factor.* The capital cost factor is calculated according to the following formula:

$$\frac{WACC}{(1-\frac{1}{1+WACC})^{lifetime}}$$

[1] See for more details on the Steady State Model and comparison with other options like Period by period and Discounted Cashflow, the BIPT Guidelines, Principles to be applied for margin squeeze tests, paragraph 3.7 Allocation of costs and revenues over time.

The relevant capital cost is determined on the basis of the WACC, which represents the relevant cost of capital of the competitor's retail business. For the purpose of the monthly calculations, the yearly WACC is translated into a monthly WACC the inverted monthly discounting for 12 periods . The calculated monthly WACC is then applied in the capital cost factor formula.

The capital cost factors are calculated in the tool for the different retail products within the portfolio as the lifetime could be different per product. They can be found in the calculation parts of the sheet, where first the investments or one-off charges are calculated and then converted into monthly amounts. The same principle applies to the different assets.

One-off charges at the end of the customer lifetime are first discounted back to the current moment using the WACC as in the following.

$$\frac{One\ time\ charge\ at\ end\ of\ customer\ lifetime}{(1+WACC)^{lifetime}}$$

Thereafter the calculated value at the current time is multiplied with the capital cost factor as described above.

One-off charges during the customer lifetime are usually expressed as an average per year/month or with a probability of occurrance per month/year. In this case, the average monthly occurrence is used.

### 2.5.3 Common costs

Operators are requested to provide absolute and average amounts of common costs (percentage of the revenue without VAT for the relevant products).

In the sheet 'Margin', the tool directly calculates the total common costs per product and for the complete portfolio based on the calculated overall revenue without VAT.

### 2.5.4 Size of the modelled operator

The model assumes the size of the modelled OLO compared to the available connections to end users on the SMP network (respectively Proximus and the cable networks). Estimated numbers of connections

The model works with the current spread of connected homes over the different local exchanges (LEX) in Proximus' network. The most up to date spread of Proximus' connected homes (via xDSL) is used as input in the sheet 'Calc-transport VLAN Lex to PoI'. The total available connected customers must also be inserted in the sheet 'Common parameters'. This field is intended to give BIPT the flexibility to either use the current total or an (forecasted) average over the regulation period or whatever value seems realistic based on the real roll out.

### 2.5.5 Central product information

Based on the latest market figures, the key products are identified as described in the principles document. The names and further details of the identified key product on the Proximus and Cable networks are then used as input in the sheet.

### 2.5.6 Weight factors / estimated number of subscribers modelled operator

Based on the current subscriber numbers for the flagship products, weight factors are calculated, which determine the importance of each flagship product in the portfolio. The weight factors are used to distribute the total estimated subscribers of the modelled operator over the flagship products.

### 2.5.7 Customer lifetime key products

The customer lifetime is used to spread the one-off revenue and charges via the capital cost factor, in order to evaluate the monthly margin. Hence this impacts the importance of the one-off revenue and charges. The model is constructed in such a way that per key product a different customer lifetime can be used.

### 2.5.8 Subscribed retail line speed

The subscribed retail up- and download speed is merely used for reference. It is not used for any calculation, as there is not a clear link between sold retail speed and required speed of the wholesale service. Instead, the modelled operator needs to estimate the capacity of the required wholesale services (VLANs) based on dimensioning information per end customer

### 2.5.9 Data allowance

This concerns the the fixed and mobile data allowance which are part of the broadband packages of Proximus. The field is used for reference in the tab ‘Revenue’ as exceeding the fixed and mobile data cap could trigger the purchase of additional data capacity which means more revenue.

In respect to the costs of the additional mobile and fixed data packages, these are not specified under ‘other costs’ but in the dimensioning profiles per customer for IP transit in the common sheet and in the costs for the mobile data card.

### 2.5.10 Underlying wholesale service WBA / BROBA

These fields steer the calculation of the wholesale costs. In the tab ’Wholesale costs WBA+BROBA’ first separately the monthly costs per customer are calculated based on a WBA connection and separately for a customer on a BROBA connection. Thereafter a weighted costs is calculated based on the setting of this parameter.

In general one could assume a 95/5% spread for WBA/BROBA based on geographical coverage or one could decide, based on the identified key products, what is the likely spread. E.g. for a 50 Mbps retail product 100% WBA, but for a 10 Mbps retail product a 95/5% spread.

### 2.5.11 Contains IPTV / fixed broadband / fixed voice / mobile voice / mobile bb

These fields describe the different components in the bundle. The first 3 (IPTV/fixed broadband/fixed voice) are used in the model. They trigger the calculated busy hour bandwidth in the dimensioning information in the same sheet. Furthermore they are used in the other tabs to activate automatically IPTV / Broadband / Voice costs where required.

The last two fields (mobile voice / mobile BB) are not used, but reserved for future use.

### 2.5.12 Dimensioning information – busy hour bandwidth

Dimensioning information is required to estimate the capacity for the:

- core network, transporting internet traffic and voice;
- aggregation network, linking the points of interconnect (PoIs) to the modelled operator's core network; and
- capacity at each connected PoI in terms of equipment and port size.

As mentioned above, the total busy hour bandwidth per key product user is automatically calculated based on the components present in the bundle (IPTV/broadband/voice).

The detailed dimensioning of PoI and aggregation network (including Multicast streams) is calculated in sheet 'Calc-transport VLAN Lex to POI'. Results of this calculation deliver input to 'Own network costs' and 'Wholesale costs WBA+BROBA'.

### 2.5.13 Dimensioning information – multicast channels

Based on the standard TV package of Proximus, the number of standard definition channels and the number of high definition channels is determined and multiplied by the required capacity per channel to derive an overall volume for the complete multicast stream. Radio channels are not considered as they need very limited bandwidth.This complete multicast stream flows between the IPTV platform of the modelled operator and Proximus to enable functions such as 'watch later', 'rewind' or 'pause', which are included in Proximus standard IPTV offer.

While the 'normal', real-time IPTV sessions of modelled operator's customers are directly transmitted from the IPTV platform of Proximus to the end user, the encryption key transmission and the rewind, watch later and pause functions require a unicast traffic flow from the OLO's TV platform to its customers. For this purpose VLAN

capacities with quality p=3 have to be considered between the OLO Network and each LEX with IPTV customers of the OLO. The demand for these VLANs is dimensioned in the sheet ‘Calc-transport VLAN Lex to POI’ according to the busy hour demand given as input in ‘Busy hour bandwidth for unicast channels per end user line’. This bandwidth demand per user is allowed to be different for each key product and will be set by the user in the sheet ‘Common Parameters’.

### 2.5.14 Dimensioning information – Maximum utilization VLAN/OLO Access line

Modelled network connections always have a maximum utilization to avoid network congestion. A normal value at the interconnection level is 80%, if utilization goes above this level additional capacity is automatically ordered in the model.

This applies for all modelled VLANs between the 5 service PoIs and the 590 LEX but also to the OLO access lines which connect the 5 service PoIs to the OLO core network.

### 2.5.15 Economic lifetimes

Economic lifetime is used to spread one-off costs over the asset lifetime in a similar manner as revenue one-off charges over customer lifetime. This could be the setup of a hand over point or a specific piece of equipment.

Normally, an OLO requires equipment to produce the retail services in its core and aggregation network, POI’s and at the customer end.

For the core network, we have used an average cost per megabit per second. This average cost includes equipment, hence no additional core equipment components are considered in the model.

For the OLO Access line, the set-up option Customer sited interconnect is used, which implies that Proximus uses its own equipment to establish the connection for the OLO and includes this in the wholesale pricing. Hence no additional equipment considered at this point. However, this OLO access line has one-off setup costs, which are distributed along the estimated lifetime of the setup.

The complete configuration of VLANs between service POIs and LEX have one-off charges, which are distributed over the approximate lifetime of the setup.

Lastly, for the customer premises equipment (internet router and TV set-top box) an estimated asset lifetime is used to calculate the monthly costs.

### 2.5.16 OPEX

Where active equipment is considered as a one-off investment (CPE in tab ‘Retail and other costs’), the corresponding expenses are distributed over the asset lifetime.

Furthermore, operational expenses are estimated on a yearly basis by using a percentage of the initial capital investment.

#### 2.5.17 Price information

These are the regulated termination charges to fixed and mobile networks, which are used in the tab ‘Revenue’ and ‘Voice traffic costs’ to calculate respectively voice revenue and voice costs of researched packages.

### 2.6 Margin sheet

The ‘Margin’ sheet reflects the overall result of the test. The unit of measure is Euro per subscriber per month. This sheet comprises a summary table on the top and a more detailed table at the bottom.

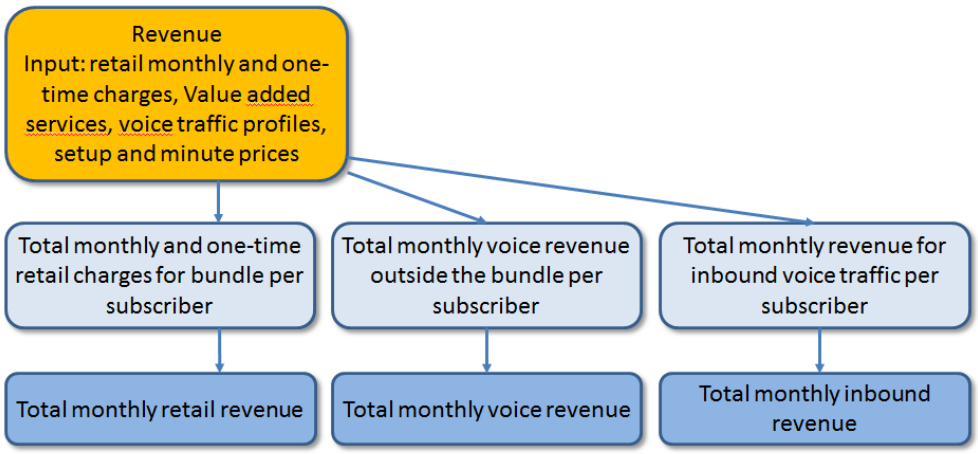
On the top left, the important parameters for WACC, market share, common costs and market share are displayed. The totals on the left side of the overview table, emphasized by blue background color, display the totals of the portfolio and the resulting portfolio margin. On the right side the specific totals and resulting margin for each considered flagship product in the portfolio are displayed.

The detailed table at the bottom displays subcategories of revenues and costs to enable further evaluation regarding the components driving the resulting portfolio margin.

## 2.7 Description of Revenue sheet

The functions in this sheet are displayed in the following figure.

Figure 6 Revenue




Per revenue category (monthly recurring, one-off charges, outbound and inbound voice), first the input values are listed, followed by a table (in light blue) which calculates the annualized monthly value for the different products.

Following revenue categories are considered in the model:

1. Revenue related to products that are **enabled by regulated wholesale inputs**, which are (1) either included in the key product retail price or (2) sold as an option. In the latter case, content related products such as premium content, TV bouquets and rental of movies are not taken into account.

   Examples of such products are listed below:

   - Fixed telephony
   - Wifi access trough homespots and hotspots;
   - E-mail accounts;
   - 2nd screen;
   - Etc.

2. Revenue related to customer premise equipment that is **required to provide the services as listed under 1 and 2 above**, which is either included in the key product retail price or charged separately (rental or purchase). Examples of such products include modems and set top boxes (decoders).

3. Any **additional revenue in connection to the services listed under 1 and 2 above**. Examples of such revenues are purchases of extra data volume packs, call charges outside the fixed telephony arrangement, revenues from inbound call termination, etc.

If retail (list) prices are discounted permanently or are temporarily reduced in the form of promotions, such discounts or price reductions are considered for the respective time period while calculating annualised monthly revenues. The same applies for promotions in which certain pricing elements (e.g. connection fees) are not charged or certain give-aways (e.g. routers, modems) are provided free of charge. If give-aways are provided free of charge, these are considered under retail & other cost valued at their production cost or purchase price. Examples of such give-aways are tablets, smartphones and mobile data packs.

The revenue components that are **not** producted on the basis of the relevant regulated wholesale inputs will be neglected when the margin squeeze test is conducted. There are two scenarios:

- Case 1: In case the mobile component is non-optional and thus part of the standard product a standalone price will be substracted from the revenue of the bundle. Bundles will generally be sold with a discount compared to the sum of the stand-alone prices. The discount will be be proportionally allocated to the targeted wholesale retail services on the one hand and the mobile component on the other.

- Case 2: In case the mobile component can be added to the bundle on an optional basis and customers can decide whether to include it we proceed as follows:
    - First: the revenue of the key product with the mobile component is calculated.
    - Second: Then we identify the discounts granted for the mobile service. The discount will be be proportionally allocated to the targeted wholesale retail services on the one hand and the mobile component on the other. The monthly monetary value of the discount will be determined and substracted from the retail revenue of the key product. In order to determine the discount, it has to be considered that only a proportion of the subscribers to the key product will use the option to subscribe to this additional service. .

The one-off retail charges at the beginning of the customer lifetime are spread over the lifetime by multiplying them with the capital cost factors. For revenues from one-off charges which might occur during the customer lifetime, such as relocating expenses, this is expressed as a percentage per year assuming an equal distribution. The monthly revenues are then calculated by dividing them by 12 months.

One-off charges at the end of the customer lifetime are first discounted back to the present and then distributed over the customer life time by applying the capital cost factor.

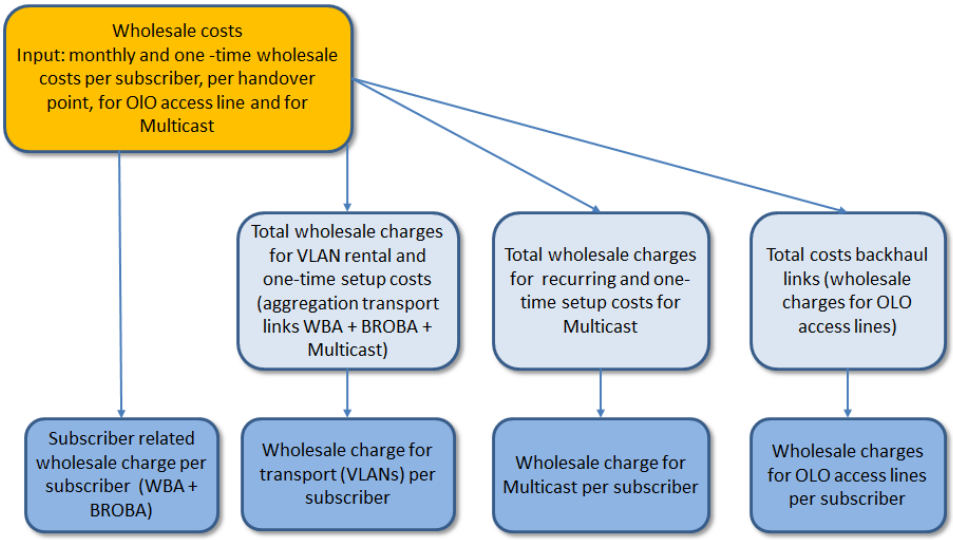
Retail bundles including voice services, may generate additional revenue for the modelled operator through charged (additional) voice bundles and/or (out of the bundle) voice traffic. The latter is based on user profiles for the specific retail bundle indicating how the voice traffic is distributed over the different destinations (on-net/off-net, fixed to mobile, etc.). Thereafter, based on the relevant retail charge, the resulting revenue is calculated.

The last revenue category, inbound voice traffic, is generated by incoming voice traffic to its customers for which the modelled provider can charge other networks based on the regulated terminating charge.

## 2.8 Detailed description of wholesale costs WBA,BROBA and Multicast

The functions in this sheet are displayed in the figure below.

Figure 7 Wholesale costs




The sheet consists of the four above mentioned blocks of wholesale costs (subscriber related wholesale charges (subscriber to LEX), Ethernet transport related wholesale charges (LEX to POI), Multicast charges (for basic IPTV package) and OLO access line charges (backhaul connections POI to OLO Core)). The subscriber related wholesale charges differ for WBA and for BROBA but are the same for the transport related wholesale charge components and for the backhaul components. Thus the subscriber related charges are separately computed for WBA and for BROBA from the respective wholesale charge input values and are weighted according to the percentage value of the underlying wholesale service per key product. These values are input values in the 'Common Parameter' sheet.

### 2.8.1 Subscriber related wholesale charges

For WBA and BROBA the structure of the subscriber related wholesale charges is comparable. The main differences lie in the magnitude of the value of the tariff components. The tariff is composed of monthly charges for the access line, and several one-off charges due at the begin of the contract, during contract period and at the end of the contract. These charges are of course model input. The one-off charges at the begin and at the end of the contract are distributed over customer lifetime. The one-off charges for events happening during contract period are estimated with the help of a

mean probability value of occurrences per year. The probability value is an input to the model.

For each wholesale charge component a monthly cost per user is computed for each key product. This is done separately for the WBA wholesale tariff and for the BROBA wholesale tariff.

In a third step a weighted mean value of the monthly cost per user is derived for each tariff component and per key product. The weight is a user input ('Percentage of underlying wholesale service WBA' in 'Common Parameters') that describes to which percentage the key product is produced with WBA and/or BROBA as underlying wholesale input.

The following subscriber related wholesale charges per user and product are computed and mirrored to the result sheet 'Margin':

| Wholesale costs - subscriber related |
|---|
| Monthly rental |
| Standard activation end user line shared VLAN including rush order activations |
| Ownership migration fee end user line shared VLAN |
| Small network adaptations |
| Number portability |
| Order related charges (change Date, Cancellation, Delivery failure) |
| Coordinated move |
| Change of speed |
| Shared VLAN additional fee for repair installation/intervention |
| Shared VLAN additional end user visit during repair |
| Fault repair |
| Disconnection |

### 2.8.2 Ethernet transport related wholesale charges

The Ethernet transport related charges are equal for WBA and BROBA, so that these charges are computed together in one step. This part of the tariff scheme is concerned with costs of the transport of the traffic of OLO's customers in the aggregation network, between LEX (or DSLAM) and the POI. The tariff structure consists of one off fees and monthly traffic volume dependent fees per VLAN, differentiated according to service quality (p=0,1,3,5).

One off fees are distributed over the lifetime of VLANs which is a model input. The number and the capacities of VLANS demanded are computed in the sheet "Calc-transport VLAN Lex to PoI" individually for each LEX and for each quality class.

The resulting sum of VLANs demanded per service quality class and the sum of the resulting monthly rentals is handed over to the sheet "Wholesale costs WBA+BROBA" to enable the calculation of the Ethernet transport charges.

The one off charges and the monthly rental charges are computed separately for the IPTV related traffic (quality class p= 3) and all other traffic (quality classes p= 0,1,5). The total costs per quality group are transformed into a cost per subscriber that relates to the number of subscribers using the quality class VLANs.

These values are mirrored to the result sheet “Margin” defining the following wholesale cost positions:

| Wholesale costs – PoI |
| --- |
| Allocated monthly costs Ethernet transport for all other services to PoI per subscriber |
| Allocated monthly costs Ethernet transport for Multicast to PoI per subscriber |

### 2.8.3 OLO access line charges

The OLO access line charges form the costs for the backhaul connections from the POI to the Core network of the OLO in the model. This service includes the bundled traffic transport to the OLO premises, including the network termination equipment. It is assumed that only 1 GE connections are demanded, which is the highest transport capacity per OLO access line offered.

The dimensioning of the OLO access lines is derived from the VLAN capacity demand computed in the sheet “Calc-transport VLAN Lex to PoI” aggregated per POI-area and differentiated according to Multicast (p=3) and all other traffic (p= 0,1,5). The number of 1 GE links is derived per POI-area considering a maximum utilization factor which is an input to the model.

### 2.8.4 Wholesale charges for Multicast

The model assumption is that the OLO replicates Proximus retail offering, so an equal (basic) TV package is modelled out of the available Proximus TV channels. To enable the transmission of these channels, for OLO’s IPTV user, the charges of the Multicast offer of Proximus have to be considered.

Considered are one off setup charges, for connecting to the TV Platform of Proximus like setup for the multicast specialist, for the encryption key interface and the TV channel interface. Further there is an activation and deactivation fee per channel to be paid. The one off charges are distributed over the asset lifetime multicast/POI which is a model input.

Beside the one off charges, there are monthly recurring charges for shared TV channels which have to be paid per channel and other recurring costs.

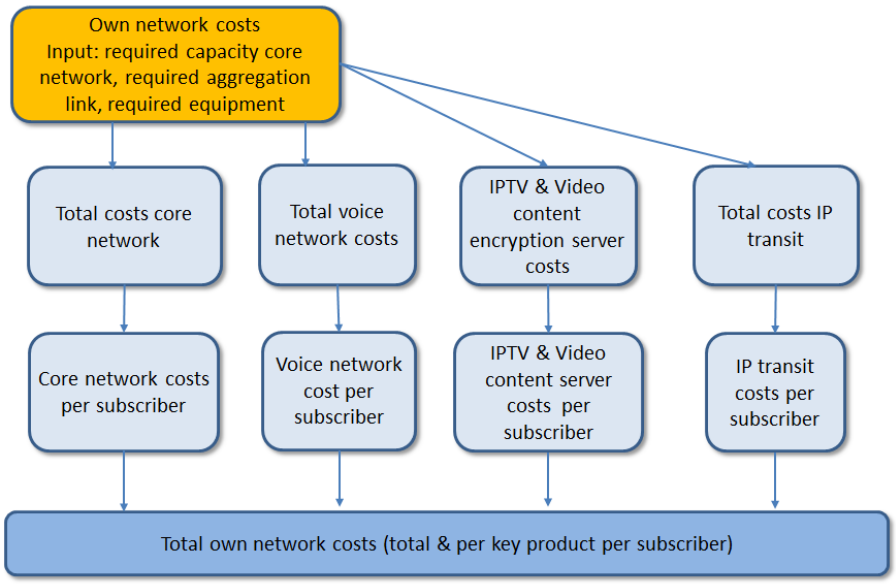
These multicast one off and recurring costs are distributed to the key products with IPTV demand in the bundle by subscriber share in total IPTV subscribers.

From this figures a cost per subscriber is computed and handed over to the sheet ‘Margin’ to be considered in the position ‘Multicast setup and decommissioning charges’.

## 2.9 Detailed description of own network costs

The functions in this sheet are displayed as illustrated in the following figure.

Figure 8 Own network costs




The resulting own network costs per product and subscriber are handed over to the result sheet „Margin“ representing the following cost positions:

| Own network and equipment costs |
|---|
| Monthly core network costs |
| Monthly costs for voice specific network equipment |
| Monthly IPTV & VCAS server costs |
| Total monthly IP transit costs |

### 2.9.1 Core network

The main input for this sheet comes from the sheet ‘Calc-transport VLAN Lex to PoI’ where the required capacity per POI-area and in total is calculated. Based on the total demanded capacity, the costs of the modelled operator’s core network are estimated based on an average cost value per Mbps for core network equipment. This is a input to the model, which will be inferred from the market participants. The total costs for OLO’s core network are distributed over the key products by using the required bandwidth as allocation key.

### 2.9.2 Voice specific network equipment

To allow for VoIP services in the OLO network, the operator has to install voice specific network equipment in its core network. This equipment may comprise Softswitches,

Access-SBC, IMS/SIP server, Session Border Controller and E1 Ports in case of interconnection with switched voice networks.

In the model we use a cost estimate for the monthly costs per voice user for such equipment to compute the voice specific equipment costs per month. This input value will be inferred from the market participants. The monthly cost per key product is derived by multiplying the subscriber number with VoIP in the bundle with this input value.

A more elaborated modelling would afford to consider and to dimension the network equipment. We abstain from a detailed modelling since the magnitude of the costs will not justify the effort.

### 2.9.3 IPTV & Video Content Authority System

The model assumption is that the OLO replicates Proximus' retail offering, so an equal (basic) TV package is modelled out of the available Proximus TV channels. The OLO needs to get encryption keys from Proximus, which are then distributed by its own VCAS server back to the CPE installed at its own customers premises. Likewise, the channels of the basic TV package are send to the TV-platform of the OLO, which enables IPTV related services like pause and replay.

The costs for the VCAS server and the IPTV platform server are considered as own network costs and are derived from a monthly cost per TV user for such equipment separately. These input values will be inferred from the market participants. The monthly cost per key product is derived by multiplying the subscriber number with IPTV in the bundle with these input values.

The cost per key product and subscriber is automatically transferred to the result sheet "Margin"

### 2.9.4 IP transit

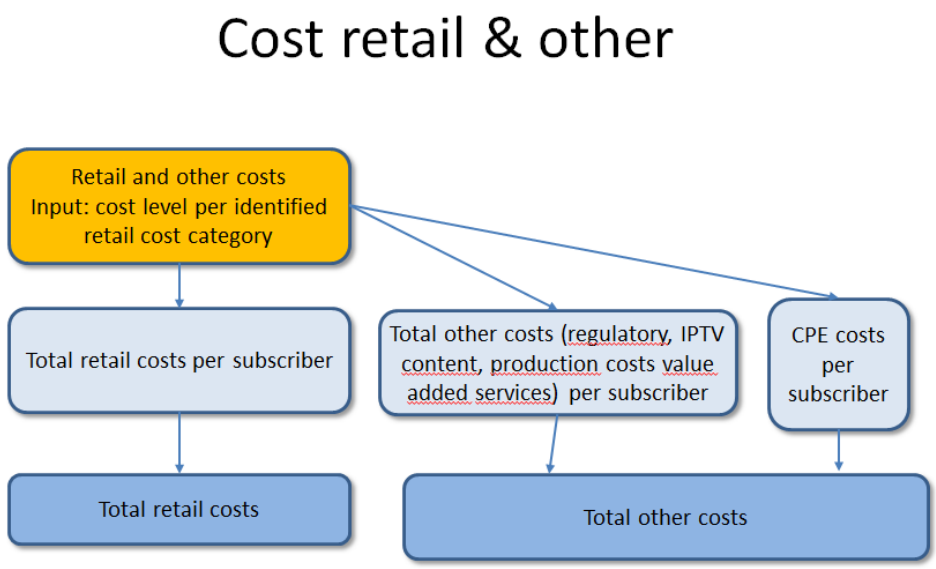
From the core network, the modelled provider needs to exchange its internet traffic and therefore connects to an internet exchange point (IXP) and/or other internet service providers. This results in IP transit costs. These costs are modelled by using an average monthly cost per Mbps, which is multiplied with the estimated amount of IP traffic computed in the sheet "Calc-transport VLAN Lex to PoI" to derive the total costs per month.

The total IP-transit costs are distributed to the key product according to its share in total IP-traffic. Further, IP-transit cost per product are distributed to the number of subscribers of each product. The resulting monthly cost per subscriber and product is handed over to the result sheet "Margin".

## 2.10 Retail and other costs

The functions in this sheet are displayed in the following figure.

Figure 9 Retail and other costs




The following retail costs are considered to be required to maintain a distribution channel for the modelled operator:

- Customer Acquisition and retention;
- Customer care;
- Marketing and advertising;
- Sales personnel salary / Sales commission;
- Billing;
- Bad debt;
- Product development / Management.

The common costs are already considered elsewhere in the model namely in the sheet ‘Common parameters’ and ’ VULA Margin’. As the retail costs are expressed as percentage of the revenues, they are based on the modelled total revenue per flagship product, which is displayed in the sheet.

Other costs include IPTV content costs for the basic TV package and the production costs of enabled bundle components which are not regulated (such as mobile data card, wifi hotspots, cloud services, email etc.).

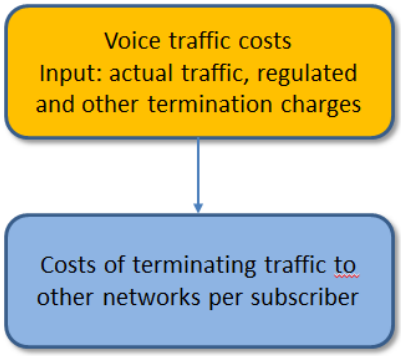
CPE can be rented to end customers or sold. In the latter case, the purchasing costs of CPE are included in the “other costs”. In case CPE is rented to end customers, formally the costs belong under own network costs, however for the sake of transparency are the purchasing costs for these scenarios as well included under other costs.

There is separate customer premises equipment (CPE) modelled for internet access (internet router) and for the provisioning of IPTV (TV set-top box). The one-off capital investment is spread over the asset lifetime with the capital cost factor. Thereafter it is tested which CPE is relevant for which flagship product so that the correct total amount of monthly CPE costs is allocated.

## 2.11 Voice traffic costs

The functions in this sheet are displayed in the following figure.

Figure 10 Voice traffic costs



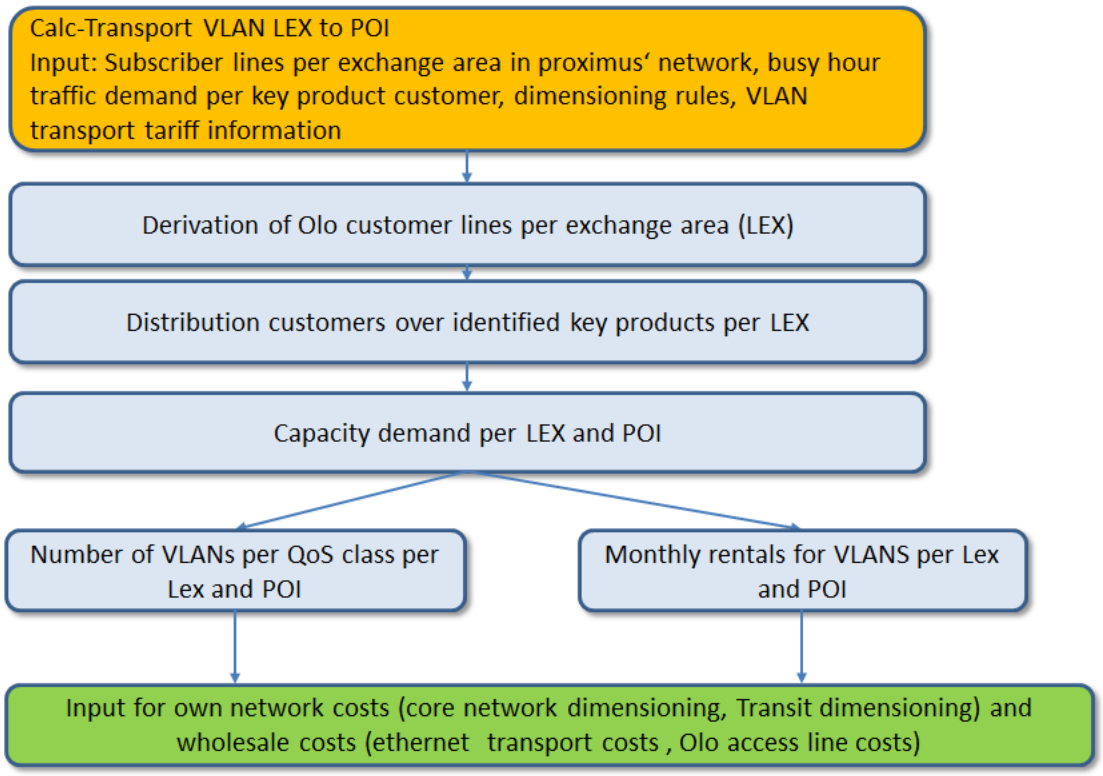

As displayed, the costs are estimated for terminating outbound traffic in other networks. The costs of producing the originating legs for this traffic and on-net traffic is omitted as the transport costs are already considered with the dimensioning of specific VLAN with quality P=5.

For the voice termination costs per flagship product, the traffic profiles need to be inserted reflecting the amount of voice traffic to each destination. For each destination either the regulated charge or the estimated average costs are used to determine the total voice costs. Setup and per minute costs are used while considering the average call duration.

## 2.12 Calculation Transport VLAN LEX to POI

The bottom-up modelling of the number of subscribers, the traffic generated by the subscribers and the dimensioning of the VLANs in the aggregation network and dimensioning of the uplinks (OLO Access Line) according to the traffic is the purpose of the tab ‘Calc-transport VLAN Lex to PoI’. Figure 11 illustrates the modelling procedure.

Figure 11 Calc-transport VLAN Lex to PoI




The customer base is derived from a complete list of xDSL customers per LEX-area for all (589) LEX-areas in the network of Proximus. The dataset allows to distinguish between residential and business xDSL customers. This list forms a basic model input to derive the number and the distribution of OLO customers according to LEX-areas. The use of such detailed data in the model seems appropriate, since there are big differences in the customer potential per LEX and the VLAN transport charge is sensitive to the capacity needed per LEX-area.

**Derivation of OLO customers**

The number of OLO's customers is derived per LEX-area.

In Model 1 (model type "res"idential) the number of residential xDSL customers per LEX-area in the network of Proximus is multiplied by the OLO market share to derive the number of OLO customers per LEX. The market share to apply is an input value provided in the sheet 'Common Parameters'.

**Distribution of customers to key products**

The OLO customers per LEX are distributed to each key product according to the subscriber share of the respective key product in the total number of subscribers of all key products. Thus we estimate the number of OLO's customers per LEX and per key product. The subscriber distribution per key product allows to consider different capacity demand profiles per key product, which is the basic reason for this modelling step.

**Capacity demand per LEX and service quality**

According to the transport tariff scheme of WBA and BROBA shared VLANs can only be ordered per LEX and per service quality. The price per VLAN and per quality class depends on the capacity demanded. The basic principle for dimensioning the VLAN is to use the busy hour demand per user. A profile of the busy hour demand per key product for the different services (broadband, VoIP and unicast video) is used to derive the capacity demanded per quality class. The busy hour demand profile per key product and service is a model input given in the sheet 'Common Parameters' and it is inferred from the market participants. In the transport tariff of the WBA and BROBA offers 4 quality classes are distinguished (Best effort (p = 0), Low priority (p = 1), Medium priority (p = 3) and Highest priority (p = 5).

To derive the capacity demand for each quality class we make an allocation of some services to the quality by technical reasons. Broadband internet traffic of residential customers is treated as best effort, broadband internet traffic of small business customers is treated as low priority traffic, multicast and unicast video traffic has to be treated as medium priority traffic and VoIP traffic is treated as highest priority traffic. The capacity demanded per quality class and per LEX is now computed by the product sum of the service busy hour demand per key product with the number of subscribers per key product for each LEX.

The busy hour capacity demand per quality class and per LEX is now used to derive per service quality the number and size of VLANs per LEX the OLO needs to order from Proximus and the monthly rental for these VLANs.

**Derivation of the number of VLANs per quality class**

Given the busy hour capacity demand per service quality, a maximum VLAN utilisation factor is considered first, which allows to guarantee spare capacities per VLAN. This utilization factor is a model input given in the sheet 'Common Parameters'. A second parameter to apply is the maximum VLAN capacity, which differs for the different service quality classes. A best effort VLAN can have a maximum capacity of 1Gbps whereas the highest priority VLAN can only have 0.3 Gbps.

The capacity demand per quality class and per LEX is divided by the utilization factor (0< utilisation factor <1) which is then divided by the maximum capacity per VLAN in Mbps. This VLAN demand figure is then rounded upwards to the next integer to give the number of VLANs needed in the service class and per LEX.

In the wholesale offer there exists the constraint that only 2 VLANs per service quality class can be rented. In the model this constraint is not considered yet, since the constraint seems to be binding only in a low number of cases and could be circumvented by shifting demand to other service quality classes or by buying dedicated VLANs. If the busy hour demand is strongly rising this topic might come up again.

### Derivation of the monthly VLAN rental per quality class

From the number of VLAN and the capacity demand a mean capacity demand per VLAN in Mbps is computed. This is used to compute the monthly rental per VLAN according to the tariff scheme given in the wholesale offers. The monthly rental is a stepwise tariff plan, with different prices for the capacity steps in Mbps. The table below lists the price scheme for the best effort quality VLAN:

| Tariff-upper limit | 10 | 100 | 500 | 1000 | >1000 |
|---|---|---|---|---|---|
| Tariff in Euro per Mbps | 2.85 | 0.32 | 0.14 | 0.06 | 0.03 |

The price for the first 10 Mbps is 2.85 €, for the capacity demand from 11 to 100 Mbps 0.32 € per Mbps have to be paid etc. A VLAN of a demanded capacity of 130 Mbps would cost per month 2.85€ * 10Mbps + 0.32€ * 90Mbps + 0.14€ * 30 Mbps = 61.50€.

The monthly rental price for the mean capacity demand is multiplied with the number of VLANs to derive the total monthly rental for VLANs to the respective LEX. The procedure is repeated for each service quality class.

At the end we aggregate separately for Medium priority traffic (p=3) and the rest of quality classes (p=0,1,5) the number of VLANs, the capacity demanded and the monthly rental for the VLANs. The separate aggregation according to Quality classes is necessary to distinguish the costs triggered by multicast services from the rest. For Multicast two separate VLANs are dimensioned (which have to be Medium priority VLANs), one to transport the encryption keys for the basic TV package to the VCAS server. This VLAN is dimensioned according to the busy hour demand for encryption keys in Mbps, which is an input value. A second VLAN is considered to transport the TV channels of the basic package to the TV platform of the OLO to enable services like pause and watch later. This VLAN is dimensioned according to the number of channels in the package and their capacity demand.

The monthly rentals for the VLANS derived are used in the sheet ‘Wholesale costs WBA+BROBA’ to estimate the monthly recurring VLAN transport costs, the number of VLANs is used to derive the setup and one-off costs for the VLAN transport. The aggregated capacities per POI area are used to derive the number of OLO access lines needed and their dimensioning in the sheet ‘Wholesale costs WBA+BROBA’. The aggregated capacities are also used in the sheet ‘Own network costs’ to compute the core network throughput and the costs for the core network. Further the IP transit costs are derived from these capacities.

# 3 Model 2: Margin squeeze tests for retail products provided to small business customers based on BROBA or WBA VDSL2 (shared VLAN) of Proximus

Small business packages are specifically made for small companies up to 10 people. The retail packages can also contain broadband, voice and IPTV.

The second model is functionally almost equal to model 1. Main differences are:

- Number of available connections in the tab ‘Common’;
- Lastly the applied key products in the tab ‘Common’.

For model 2 the available connections in the tab ‘Calc-transport VLAN to PoI’ are based on a certain % of the connections in the business column (E) are used multiplied by the marketshare.

The % used of the total business connections for small business customers is steered by the second field ‘Estimated number of xDSL based business customers’. This is set on 10% based on information from the BIPT.

# 4 Model 3: Margin squeeze tests for retail products provided to customers based on cable access

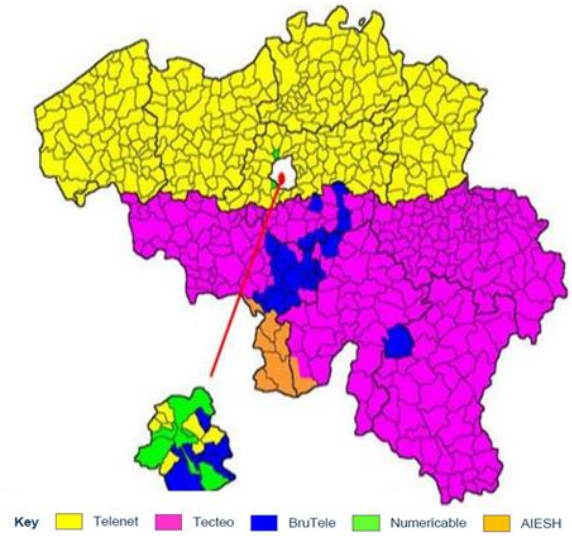
## 4.1 Footprint for retail services provided to customers based on cable access

The geographical dimension of the relevant business cases is determined in accordance with the respective cable operators' footprint and is broadly as shown in figure 12.

- Telenet: Flanders, parts of Brussels and a small part of Wallonia;
- Brutélé: Parts of Wallonia and parts of Brussels;
- Nethys (previously Tecteo): The largest part of Wallonia and a small part of Flanders;
- Numericable: Parts of Brussels and Wallonia (Hainaut, ex-AIESH) and a small part of Flanders.

Related to the different networks, we have described the setup of the model for accessing Telenet's cable network, VOO's cable network and lastly Numericable's network. In the Telenet description, we have entered into the details, whereas in the VOO and Numericable part we have highlighted the aspects that are different from the Telenet setup. The model will be adjusted after the consultation in the sense that it will address the particularities of the three cable operators (by means of dedicated tab sheets or sections).

Figure 12: Coverage areas of cable operators




Note: Nethys (previously Tecteo) and BruTele jointly operate under the Brand VOO.

Source: http://www.bipt.be/fr/operateurs/telecom/marches/radiodiffusion/analyse-de-marche-radiodiffusion-televisuelle- 2011/decision-de-la-conference-des-regulateurs-du-secteur-des-communications-electroniques-crc-du-1er-juillet-2011- concernant-lanalyse-du-marche-de-la-radiodiffusion-televisuelle-sur-le-territoire-de-la-region-bilingue-de-bruxelles-capitale

## 4.2 Key products to be tested based on cable access

The regulatory obligation requires each cable operator to enable the replication of an analogue or digital television offering either or not as part of a bundle. When combined with broadband, the product range comprises a certain number of technical profiles (standard profiles and 2 additional customised profiles[2]). A technical profile is determined by the download speed, the upload speed and the data allowance.

However, currently wholesale cable access is not being largely deployed. Therefore, the BIPT assumes that an access seeker will target the most demanded products in a certain cable network area which are in line with the most important products of the cable operator itself.

The BIPT defines key products for each cable area as the (historical and current) retail products of the cable operator, which – in decreasing order - in sum represent 70% of its relevant retail subscribers. All (historical and current) retail products offered by the cable operator which represent a share of at least 10% of current subscribers or revenues will be included by default.

## 4.3 Access to Telenet cable network

The OLO first needs to prove that the TV content rights in relation to the channels that are included in its offering, have been paid before he can launch commercially. In addition, for cable access, access seekers might need to pay contributions for the promotion of audio-visual content and local TV contributions as well depending on regional requirements. These costs will be considered in the margin squeeze model.

Telenet provides access to :

- its analogue and digital TV service;
- its broadband offering and;
- its interactive services like video on demand (VoD).

In regard to analogue and digital TV, the OLO can also buy analogue TV separately or buy analogue and digital TV together or a wholesale bundle including broadband (called double play in the reference offer). For each scenario there are separate wholesale tariffs for activation and installation.

In regard to VoD, the implementation (and thus cost) depends on the demand of an access seeker. Given that OLO's 'produce' their VoD service based on their own solution, there is currently no demand and thus no implementation and pricing. Hence,

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**2** See http://www.bipt.be/public/files/fr/21023/telenet_+FR.pdf, http://www.bipt.be/public/files/fr/21022/codite_+FR.pdf and http://www.bipt.be/public/files/fr/21021/brutele_FR.pdf

for the purpose of dimensioning, it is assumed that OLO's VoD traffic flows over the available IP bandwidth, which is also used for the provision of broadband.

Certain interactive services like 'Pause, Rewind' can be delivered by the OLO based on the capacitites of the STB. The STB 'buffers' the desired streaming content from Telenet's network for a certain period and the customers can view the content at the desired moment. Hence the 'Pause, Rewind' functions can be offered by the OLO without using Telenet's interactive services.

However, the interactive function 'catch-up TV' (able to view TV content up to multiple days later), which is offered by Telenet trough the option "Play", can not be realized based on the STB functionality. The OLO would need to have access to historical data streams and provide the specific end user with this information from dedicated servers (comparable with a unicast stream in Model 1+2). When more information is available on this implementation aspect, this will be considered in the model.

### 4.3.1 Resale of analogue TV of Telenet

Analogue TV is purely resold by an alternative operator, so the alternative operator does not require own network infrastructure or a connection between the OLO network and Telenet.

However, an alternative operator has retail costs like marketing and sales and acquisition costs. These will be added when calculating the total downstream costs for producing the retail analogue TV products.

### 4.3.2 Resale of digital TV of Telenet

In theory, the resale of Telenet's digital TV platform requires the alternative operator to connect to Telenet's digital TV platform to enable him to insert its own digital content, which Telenet can then distribute to the end users.

However for the modelling this 'injection of own digital TV content' is not considered, as the purpose is to replicate Telenet's retail offer for which the available digital TV content suffices. Therefore no connection is modelled in the margin squeeze test.

An active NIU is required at the end user location to use the retail service. An alternative operator installs this NIU itself.

In order for the end user to get access to the digital channels[3], a set top box (STB) is required, which decyphers and unscrambles the content available at Telenet's network. A so called conditional access system (CAS) at the OLO site, provides the STB with the

[3] For analogue channels no NIU is technically required.

required encryption codes. For this purpose the CAS in the OLO network needs to be connected with Telenet's head-end for retrieving the keys and control words.

For the dimensioning of this connection, we assume a busy hour demand value in kbps per end user.

### 4.3.3 Resale of broadband of Telenet

The resale of broadband services by the OLO is always done in combination with the resale of TV. For the provisioning of retail broadband, the OLO needs to have one redundant physical interconnection between its own network and one of Telenets regional points of interconnect (RPoI). The other 3 RPoIs are aggregated by Telenet via virtual local area network connections (VLANs) and brought to the one RPoI, which is physically interconnected by the OLO. Telenet transports the IP traffic from the end user to its (physical) hand over point and the OLO transports the IP traffic from the hand over point to an Internet exchange point from where the IP traffic is exchanged.

An active NIU is required at the end user location to use the retail service. An alternative operator installs this NIU itself. Furthermore, the OLO requires a DHCP server to control the IP numbers of the end user devices.

For the dimensioning of the 'broadband' interconnection, the total number of connected end users for the OLO is multiplied by a certain amount of kbps in the busy hour per end user.

### 4.3.4 Resale of Video on demand

As described above, we consider that OLOs produce their own VoD solution in their network. However, since VoD is considered as a content related product, the revenues related to the rental of movies is not taken into account[4] and hence the related costs have not been modelled. This is currently reflected in the model by putting the dimensioning parameter (line 49 in tab 'common') at '0'. This impacts the calculated 'VoD' traffic in the tab 'own network'.

In case the resale VoD solution will be used in the future, the following is applicable:

- VoD is encrypted by a third party through CAS, which allows the STB to decrypt, and, if required, unscramble the signals. The VoD and CAS systems are located at OLOs premises;
- Telenet can provide the VoD storage and the return communication path from the STB to the handover point. The OLO needs to arrange in any case its own VoD

[4] See Draft BIPT Guidelines – Principles for margin squeeze tests, section 4.2.

mediastorage and the catalogue function and the encryption of the TV signals via a third party, specialized in CAS;

- The VoD stream needs to be transported via a separate interconnection link (over which also the management signals for the STB flow). If the OLO connects one additional interconnect link for the transport of VoD info, then Telenet will aggregate the VoD streams from the 4 regions in its network to the Regional Points of interconnection (RPoIs).

### 4.3.5 Physical interconnection between OLO and Telenet

There needs to be at least one redundant link between the OLO and one of the RPoIs of Telenet. Telenet has 4 regions in its network and in case the OLO connects one RPoI then the OLO traffic from and to the other 3 regions needs to be aggregated by Telenet via logical links, so called VLANs.

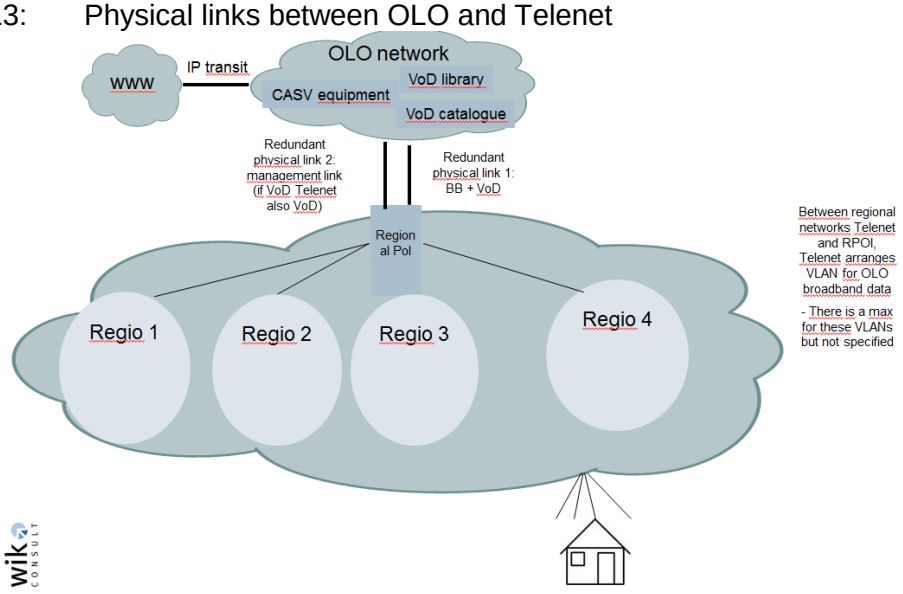
Telenet mentions that there is a maximum capacity on the VLAN's but at this point in time it is not known what this maximum will be. Thereafter, the OLO needs to connect the respective Telenet RPOIs also with a physical redundant link. Therefore, it is not considered, however the model can be updated by changing the number of physical and logical links in the 'own network' tab.

In addition to three logical VLANs between the other RPOIs of Telenet and the connected RPOI, we have dimensioned two separate physical redundant links from the OLO to the connected RPOI:

- One for the transport of broadband and VoD traffic (currently no VoD as the dimensioning parameter on tab Common is set at '0');
- One management link to retrieve the encryption keys from Telenet for OLO's CAS, which at his turn provides the CPE with the encryptions keys.

See below figure displaying the physical links between OLO and Telenet

Figure 13: Physical links between OLO and Telenet



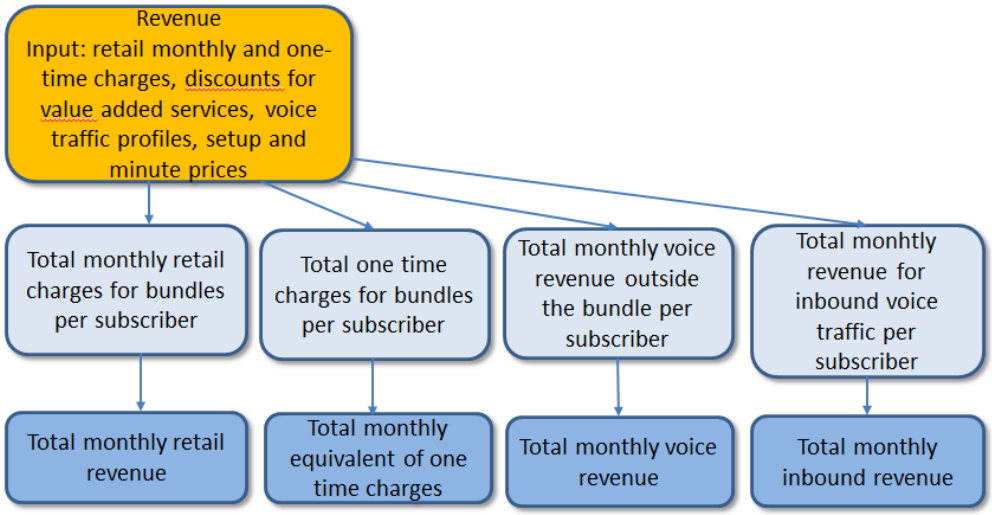
### 4.3.6 Revenue components

In order to calculate the revenue, Telenet's retail offers have been analysed and the following revenue categories have been identified to be considered for an OLO:

- Monthly recurring charges and discounts;
- One-off charges and discounts;
- Revenue charged for voice calls placed by OLO customers (outbound voice);
- Revenue received by OLO for terminating incoming voice calls from other networks (inbound voice).

An overview is provided in the figure below.

Figure 14: Revenue




Recurring charges consist of:

- Basic product revenue;
- Revenue charged for eventual extension of fixed internet data caps (when applicable).

Recurring discounts may include:

- Discounts in connection to basic recurring product revenue, usually applied for a limited period though (e.g. 3 months);
- Structural monthly discounts in connection to additional services like mobile subscriptions.

One-off charges include:

- One-off charges at the beginning of the contract like activation and installation charges;
- One-off charges during the contract duration such as moving charges; One-off charges at the end of the customer lifetime such as termination charges.

One-off discounts:

- Mainly occur at the start of the contract (upon ordering the initial subscription) as well as during the customer lifetime upon ordering devices like tablets, smartphones and/or (interactive) services (e.g. Play and Security for Telenet).

This is the way one-off charges and discounts are considered in the model:

- One-off charges and discounts at the start of the contract are spread over the customer lifetime by multiplication with the capital cost factor;
- One-off charges and discounts during the contract period are calculated by multiplying the probability per month times the one-off charge or discount;
- One-off charges at the end of the customer lifetime are first discounted back to a current net present value and then spread over the lifetime by multiplying these with the capital cost factor.

Revenue charged by the OLO for voice calls – up and above eventual free minutes included in voice bundels - is based on the actual billed minutes (taking into account setup and per minute costs). Recurring revenue of voice bundles is included as well. The costs of voice termination are considered in the tab ‘voice traffic costs’.

The last revenue category is revenue received by the OLO from other operators for terminating voice calls to its own retail customers. To estimate the number of these calls, we have assumed that the market share of Telenet’s connections also reflect the balance between outgoing and incoming minutes from and to its own retail customers. Based on the amount of outgoing traffic, the amount of incoming traffic is then estimated based on this market share.

### 4.3.7 CPE management

Cable operators formally have three different types of customer premises equipment (CPE), which could be integrated or not:

- Network interface unit (NIU), with a coax connection to which the end user can directly connect its TV to receive analogue TV;
- Set top box (STB), which is connected to the NIU and communicates over a management channel with the OLO CAS system to get access to encrypted digital TV streams of the cable company;
- Cable modem, which is connected to the NIU as well and used for the provisioning of an internet connection. The modem transfers received cable signals into IP traffic and vice versa for sent IP traffic.

From a revenue perspective, STBs can be bought from Telenet and VOO (certain models – see footnote 5 for more details) but not from Numericable. The latter integrates all functions in one box, which can only be rented. The % of the customers renting the STB (monthly revenue) is linked to a cell under ‘one-off revenue’. CPE purchasing costs are considered as well.

### 4.3.8 Wholesale costs cable

The wholesale charges the OLO has to pay for accessing customers in the Telenet network are taken from the reference offer of Telenet. The tariff is composed of monthly charges for the access line, and several one-off charges due at the beginning of the contract and during the contract period. These charges are used as model input. The one-off charges at the beginning of the contract are distributed over customer or asset lifetime where applicable. The one-off charges during the contract period are estimated with the help of a mean probability value of such occurrences per month. The probability value is an input to the model.

Furthermore, there are recurring and one-off charges for the setup of interconnection links. The tariff scheme distinguishes physical links, comprising management and data links, and logical links. The costs for the physical connections itself are derived in 'Own network costs', based on leased line prices. The dimensioning of these links is also derived in the sheet 'Own network costs'.

For each wholesale charge component a monthly cost per user is computed for each key product.

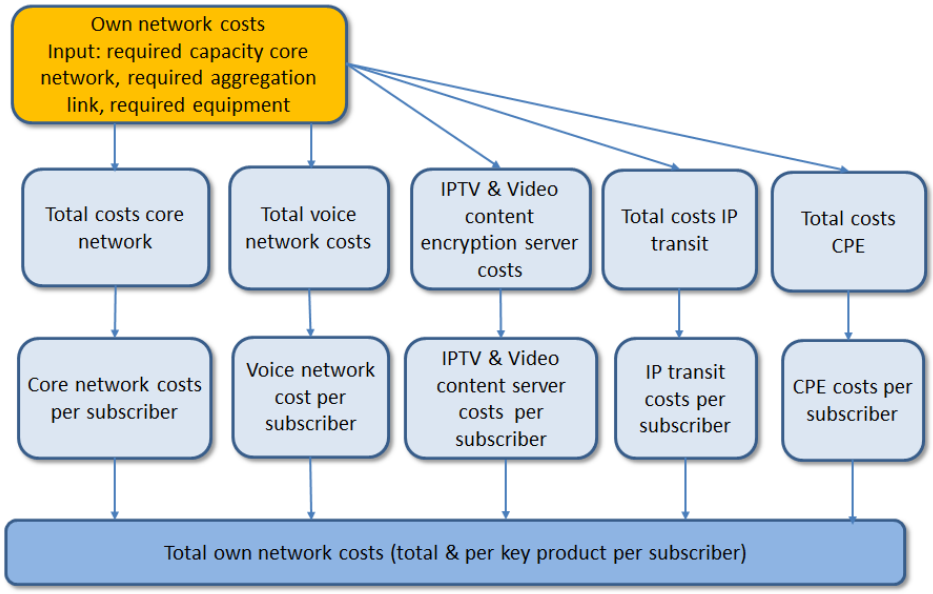
The following subscriber related wholesale charges per user and product are computed and mirrored to the result sheet 'Margin':

| Wholesale costs considered |
|---|
| Monthly rental for wholesale product |
| Monthly rental for surpassing data limit |
| Monthly subscription "interactive services" (VoD) |
| Start-up costs of implementation Analog TV + Digital TV + broadband |
| Activation of line per customer |
| Activation of service per customer |
| Compensation for cable connections |
| Installation charges of NIU |
| Compensation for manual address search |
| Compensation for moving installation appointment |
| Compensation for incorrect fault notification |
| Performed actions due to incorrect fault notification |
| Compensation for repair because of incorrect actions and damage of SMP network |
| OLO interconnection links wholesale charges |

### 4.3.9 Own network costs

The functions in this sheet are displayed as illustrated in the following figure.

Figure 15 Own network costs




The resulting own network costs per product and subscriber are handed over to the result sheet „Margin“ representing the following cost positions:

| Own network and equipment costs |
|---|
| Monthly core network costs |
| Monthly costs for voice specific network equipment |
| Monthly IPTV & VCAS server costs |
| Total monthly IP transit costs |
| Total monthly leased line connection costs |
| CPE costs |

#### 4.3.9.1 Core network

Based on the total demanded capacity, the costs of the modelled operator’s core network are estimated based on an average cost value per Mbps for core network equipment. This is an input to the model, which will be inferred from the market participants. The total costs for OLO’s core network are distributed over the key products by using the required bandwidth as allocation key.

#### 4.3.9.2 Voice specific network equipment

To allow for VoIP services in the OLO network, the operator has to install voice specific network equipment in its core network. This equipment may comprise Softswitches,

Access-SBC, IMS/SIP server, Session Border Controller and E1 Ports for interconnection with switched voice networks.

In the model we use a cost estimate for the monthly costs per voice user for such equipment to compute the voice specific equipment costs per month. This input value will be inferred from the market participants. The monthly cost per key product is derived by multiplying the subscriber number with VoIP in the bundle with this input value.

A more elaborated modelling would require considering and dimensioning the network equipment required for producing the voice service. We abstain from this since the magnitude of the voice costs does not justify the effort.

#### 4.3.9.3 TV, Video content & Conditional access system

The model assumption is that the OLO replicates Telenet's retail offering, so an equal (basic) TV package is modelled out of the available TV channels.

Analogue TV is provided from the cable operator's network. Digital TV is also provided from the cable operator's network, however the OLO needs to arrange the encryption of the signals. For this, a so called conditional access system (CAS) is required, which is located in the OLO's premises. The CAS server provides the encryption keys, which are distributed to the CPE at the customer premises. With these keys, the set top boxes at customer site can access the TV content on the cable company's network. For accessing the digital TV, the OLO needs to set up its own catalogue function as well.

For interactive services like pause, rewind, personal video recording etc., the OLO will use the functionalities of the STB. For TV replay, the OLO needs to implement a certain infrastructure. At this point in time, information on this aspect is not yet available.

The costs for the CAS server, the TV platform server and the catalogue function are considered as own network costs and are requested as a monthly cost per TV user from the access seekers. The monthly cost per key product is derived by multiplying the relevant subscriber number with TV in the bundle with these input values.

The total cost per key product and subscriber is automatically transferred to the result sheet "Margin"

#### 4.3.9.4 IP transit

From the core network, the modelled provider needs to exchange its internet traffic and therefore connects to an internet exchange point (IXP) and/or other internet service providers. This results in IP transit costs. These costs are modelled by using an average monthly cost per Mbps, which is multiplied with the estimated amount of IP traffic computed in "Own network costs" to derive the total costs per month.

The total IP-transit costs are distributed to the key product according to its share in total IP-traffic. Further, IP-transit costs per product are distributed to the number of

subscribers of each product. The resulting monthly cost per subscriber and product is handed over to the result sheet “Margin”.

#### 4.3.9.5 Total monthly leased line connection costs

The leased line costs in the model are based on Leased Lines prices of Proximus and a certain volume discount considering the applied scale in the model. In the Proximus offer only 1Gbps leased line prices are available. However, considering the volume of the traffic generated, 10 Gbps links are a realistic alternative as well and will therefore be added.

#### 4.3.9.6 CPE costs

The CPE costs are annualised over the economic lifetime of the CPE and added to the operational expenses to derive a monthly cost. Based on the offered key product, the relevant CPE is considered (NIU, cable modem and set top box).

Cable operators package the three types of CPE in different manner:

- Telenet: separate NIU, cable modem and STB. Customers can buy or rent the STB;
- VOO: separate NIU, cable modem and STB (with integrated cable modem for interactive services). The STB can be bought (certain models) or rented;
- Numericable: one integrated box, which can only be rented.

### 4.3.10 Retail and other costs

The retail cost categories are expressed as absolute amounts or as a percentage of the revenue (without VAT). If input is provided in absolute amounts, we first convert these into a percentage.

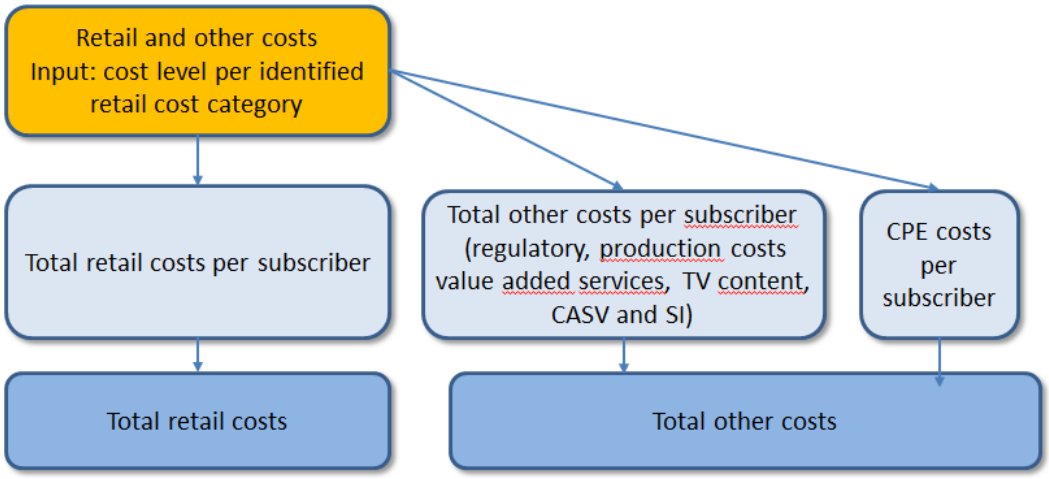
Based on the calculated total monthly revenue, the absolute amount for the retail cost categories per key product are calculated.

Other costs are split into:

- Production costs for non regulated components in the bundle (like Wifi, mail etc.);
- TV content costs (with a likely split in analogue and digital);
- Conditional access system costs for the third party. A fixed monthly component and a cost per customer is considered;
- System integration costs for linking the OLOs systems to the cable operator.

See following figure for an overview.

Figure 16: Retail and other costs




### 4.3.11 Voice traffic costs

Based on the actual traffic data, the termination costs are calculated of terminating the traffic to the different destinations (national fixed, mobile, premium rate etc.).

The costs for the OLO to originate this traffic on its own network are considered by the average costs of its core network and a charge for voice equipment under the tab ‘own network costs’.

## 4.4 Access to VOO (Nethys, Brutélé) cable network

Some parts of the reference offer are still in the process of being developed or implemented.

The OLO first needs to prove that the TV content rights in relation to the channels that are included in its offering, have been paid before OLO can launch commercially. In addition, for cable access, access seekers might need to pay contributions for the promotion of audio-visual content and local TV contributions as well depending on regional requirements. These costs will be considered in the margin squeeze model.

For the resale of digital TV, the same applies to VOO as for Telenet, only that the NIU is currently installed by VOO.

For the resale of broadband, VOO currently installs the NIU.

For the resale of Video on demand, the setup is more complex. VOO forces the access seeker to invest in his own VoD streamers that interface with the capacity management system from VOO. However the integration of VoD streamers from two different parties with a single capacity management has never been done before because VoD streamers and capacity management are typically part of a single VoD service

installation. Hence the implementation of the suggested architecture seems highly unlikely given the high technical complexity (and ensuing costs and timings). .

The physical interconnection between OLO and VOO is analoguous to Telenet but might be slightly different due to different number of regions.

CPE arrangement:

- VOO installs its own Network Interface Unit (NIU) and executes the connection to the network;
- The Set Top Box (STB) has an integrated modem for the interactive services;
- Customers can buy or rent the STB[5].

## 4.5 Access to Numericable (Coditel reference offer) cable network

Reference offer is in the process of being developed.

The access conditions to the Numericable network are set forth in Coditel's reference offer. Numericable is the brand name that is used in relation to the products that are commercialized by Coditel. If any reference is made to Coditel in the present and/or other documents, this actually concerns Numericable.

The OLO first needs to prove that the TV content rights in relation to the channels that are included in its offering, have been paid before OLO can launch commercially. In addition, for cable access, access seekers might need to pay contributions for the promotion of audio-visual content and local TV contributions as well depending on regional requirements. These costs will be considered in the margin squeeze model.

For the resale of digital TV, the same applies to Numericable as for Telenet, only that it doesn't require a NIU.

For the resale of broadband, Numericable does not require a NIU.

For the resale of Video on demand, Numericable offers VoD using infrastructure of Numericable France. This forces an OLO to use the infrastructure from Numericable France (which is not regulated), hence a resale VoD solution might not even be possible for Numericable..

The physical interconnection between OLO and Numericable is analogous to Telenet but might be slightly different due to different number of regions.

CPE arrangement:

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5 The VOObox is an entry level decoder that can be purchased at €99. This is a decoder without interactivity and without hard drive. Sales of this product will be discontinued in the near future. The VOOcorder and the Box.évasion can only be rented.

- The cable modem, NIU and STB are integrated in one box (so no installation NIU required);
- The integrated Customer Premise Equipment (CPE) can only be rented by customers.

# 5 Model 4: Margin squeeze tests for retail communications services provided to business customers based on wholesale terminating segments of NGA leased lines

To be completed at a later stage.

# 6 Model 5: Margin squeeze tests for retail broadband access services to large business customers based on wholesale broadband access

To be completed at a later stage.

# 7 Remarks considering the data set used in the model

## 7.1 Using the model

In order to use the model, all orange fields in all sheets need to be populated. The only exception is where voice /internet /IPTV product details are not relevant for the respective flagship in case the bundle does not contain one or more of these products. The relevant orange input fields are filled in with validated data, hence the most important parameters need to be verified regularly .

Important here is the actual LEX list with the number of available connections for each of the 590 Local exchanges.

The results that are shown in the sheet ‘Margin’ are calculated automatically once the required data is inserted.

For practical purposes, all fields except the input fields can be protected as well as the the sheet structure and layout.

## 7.2 Data collection and validation

BIPT has sent out data requests to the operators with significant market power (Proximus and the cable operators) and a selection of OLO‘s in the residential and business market. The collected data has been validated by WIK and BIPT. WIK has compared received data between operators and proposed a certain value while considering the different OLO’s in the Belgian market and by comparing data with benchmark data. With the proposed values the draft model is tested. The final data set to be applied in the final model needs to be validated by BIPT.

During data collection, we have asked operators to mark data as confidential when applicable. The data collection sheet contains confidential data and will therefore not made public. As a consequence, the model itself that will be submitted for consultation, will not contain (actual) data.

## Annex Acronyms used

| | |
|---|---|
| BH | Busy Hour |
| BHB | Busy Hour Bandwidth |
| BNG | Border Network Gateway |
| BW | Bandwidth |
| Cap | Capacity |
| CPE | Customer Premises Equipment |
| Gbps | Gigabit per second |
| GPON | Gigabit Passive Optical Network |
| HD | High Definition |
| IP | Internet Protocol |
| IP–Switch S | Internet Protocol Switch – small |
| IP–Switch M | Internet Protocol Switch – medium |
| IP–Switch L | Internet Protocol Switch – large |
| IP Transit | Internet Protocol transit |
| IPTV | Internet Protocol Television |
| IXP | Internet Exchange Point |
| LC | Line Card |
| LER | Label Edge Router |
| LSR | Label Switch Router |
| Mbps | Megabit per second |
| MPOP | Metropolitan Point of Presence |
| ODP | Operator Distribution Point |
| OLO | Other Licensed Operator |
| OLT | Optical Line Termination |
| OPEX | Operational Expenditures |
| OOC | One-off Charges |

| | |
|---|---|
| SD | Standard Definition |
| VAT | Value Added Tax |
| VOD | Video on Demand |
| VoIP | Voice over IP |
| WACC | Weighted Average Cost of Capital |