# Belgacom Regulatory Cost Model 2009

General Description

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# 1 General description

Le département REG (Group Regulatory Affairs) assure la préparation des comptes séparés et opère le modèle d'élaboration des coûts sous-jacent à la production des coûts séparés et utilisé dans différents autres dossiers régulatoires. Conformément aux recommandations de la Commission Européenne, la totalité des coûts issus de la comptabilité générale (statutaire) est prise en compte dans le cadre de l'élaboration des comptes séparés et du modèle de coûts sous-jacent, à l'exception des comptes 65, 67 et des coûts des autres comptes écartés du périmètre. Les coûts utilisés dans l'exercice de modélisation sont directement issus du système SAP qui administre la comptabilité générale de Belgacom S.A. Les comptes statutaires ont fait l'objet d'un audit statutaire en 2010 effectué par Ernst & Young, Réviseurs d'Entreprises. Le collège des réviseurs d'entreprises a émis une attestation sans réserve des comptes annuels.

Les comptes séparés émanent des flux d'allocation de coûts réseau , IT et des flux ABC du système de comptabilisation des coûts de Belgacom, incluant le périmètre issu de la comptabilité générale ainsi que le coût du capital repris dans ces deux modules.

Le schéma suivant représente la structure du système de comptabilisation des coûts et mentionne les flux principaux. L'entièreté des éléments de coûts présents dans les flux est intégrée dans un logiciel (INCA) qui en effectuant des tests de validations empêche toute possibilité de double comptage ou d'attribution multiple.

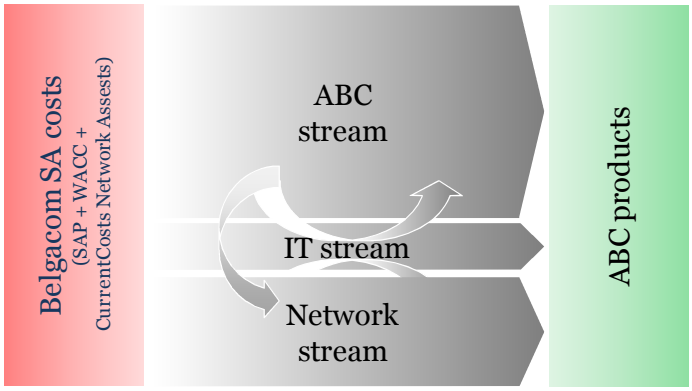



**Figure 1**

Les flux d'allocation de type ABC reprennent les coûts commerciaux et les autres coûts directs ou indirects qui ne sont pas repris dans les flux d'allocation « réseau » ni dans les flux « IT ».

Les flux « réseau » et les flux « IT » quant à eux , traitent tous les coûts en matière de réseau et de technologie de l'information , à l'exception de l'activité « End-User Support ».

Des ajustements liés au passage des coûts historiques aux coûts courants sont effectués pour les coûts des actifs du réseau et ont pour effet d'augmenter la base de coûts pris en compte dans le modèle de comptabilisation des coûts.

Faisant partie d'un seul et même modèle intégré et prenant leur source à une seule base de coûts , les flux d'allocation « ABC » , « réseau » et « IT » sont vérifiés par l'outil de gestion de modèle

INCA assurant l'absence de double comptage et la traçabilité des données calculées jusqu'aux données du système SAP.

Le modèle d'élaboration des coûts de revient par produit suit l'approche "top-down".

# 2 Model Allocation Structure

This section provides the global view on the allocation structure of the model exhibiting the major allocation flows and introducing the major building blocks and concepts in the model. See Figure 2 and Figure 3 .

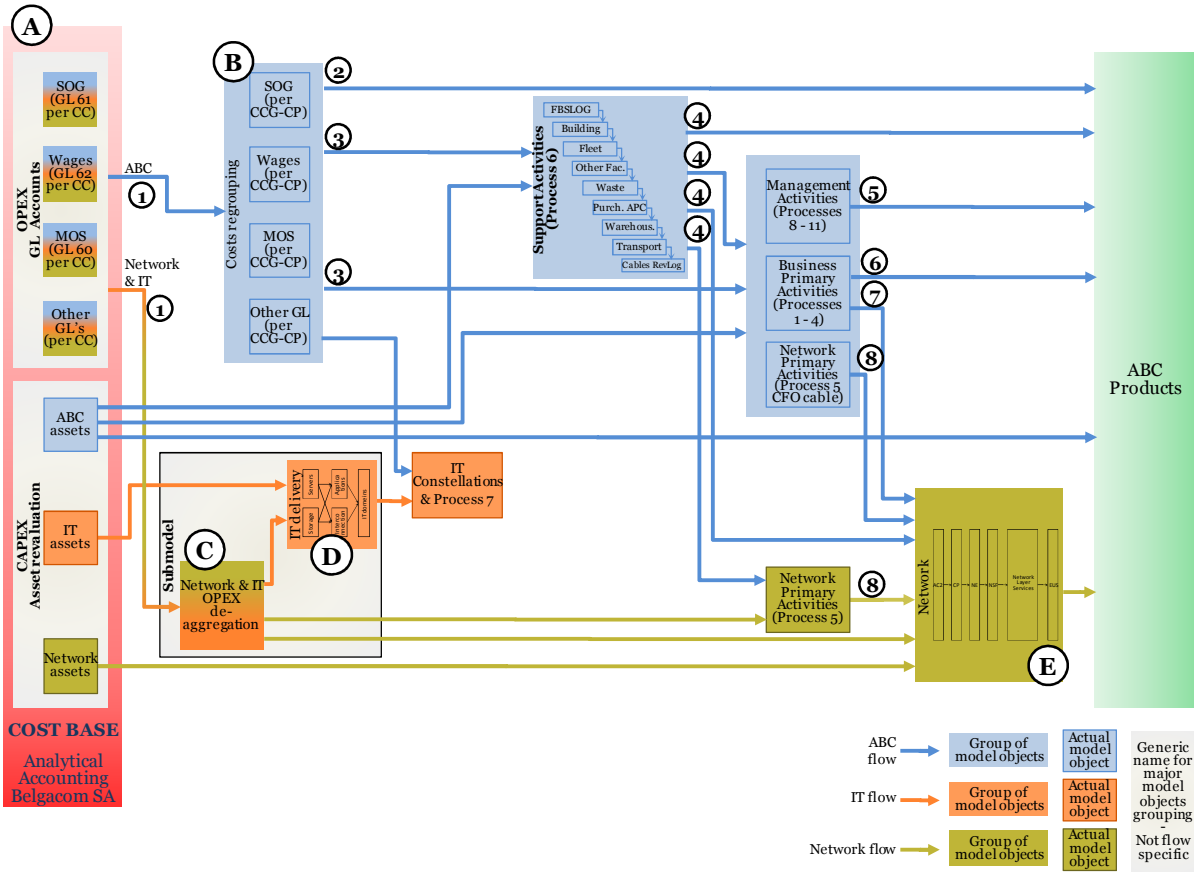



**Figure 2:** Graphic representation of the Belgacom Regulatory Cost Model 2009, without "IT constellations & Process7" allocations

Note: there is no relation between the size of the objects and the related costs or the complexity of the performed processing.

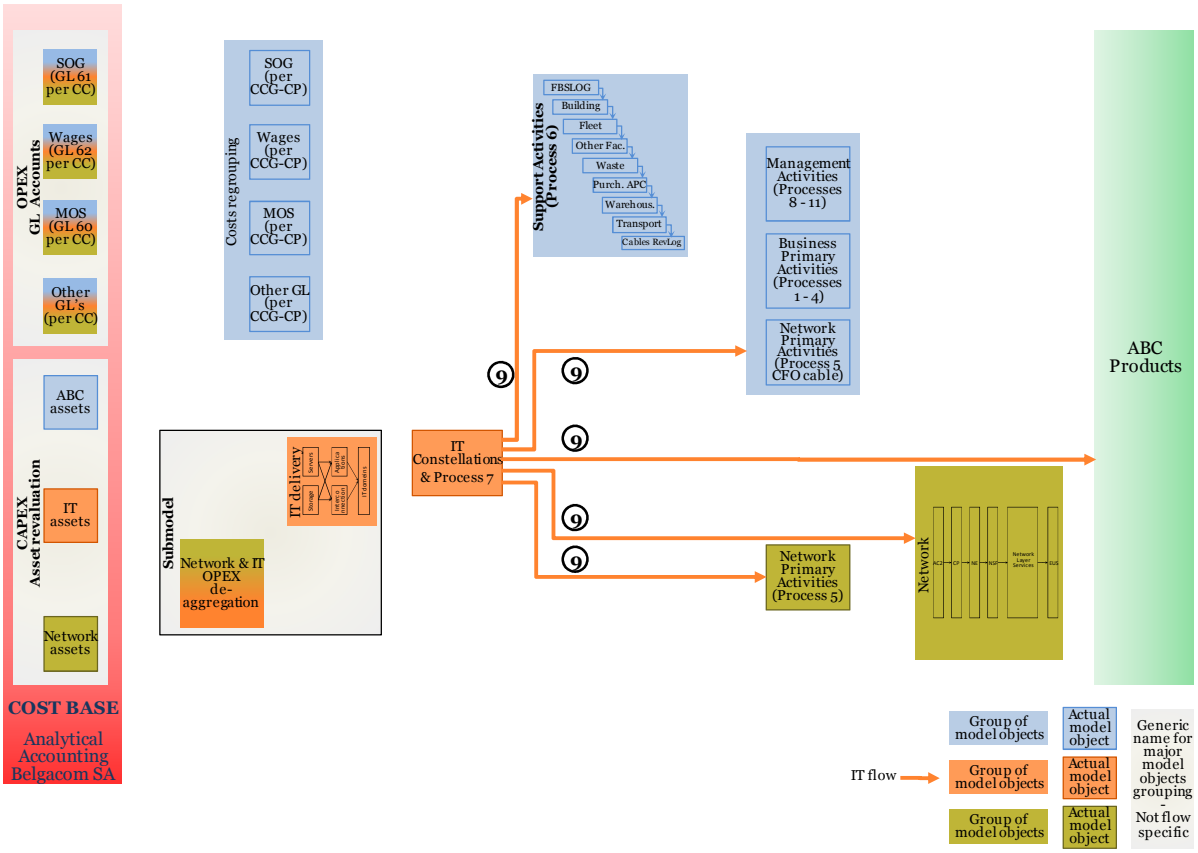



**Figure 3:** Graphic representation of the Belgacom Regulatory Cost Model 2009, only "IT constellations & Process7" allocations

| Reference in scheme | Paragraph in document |
|---|---|
| A | 3 Cost Base |
| B | 4.1 Step1: Costs regrouping |
| C | 5 Network&IT OPEX de-aggregation |
| D | 6.1 IT delivery |
| E | 7.1 A layered allocation model<br>7.2 From Assets to Network Stage Functions.<br>7.3 End User Services<br>7.4 Network services of the passive infrastructure layer : NLS1.0<br>7.5 Network services of the optical layer (NLS1.1-Services)<br>7.6 Network services of the transmission infrastructure<br>7.7 Network services of the packet based infrastructure<br>7.8 Network services of the IP infrastructure layer (NLS3-IP)<br>7.9 Network Services of the application layer |
| 1 | 3.3 Répartition du périmètre des coûts entre le module ABC et le module Network / |

| | |
|---|---|
| | IT |
| 2 | 4.2 Step 2: Allocating costs directly to the products |
| 3 | 4.3 Step 3: Allocating costs to activities |
| 4 | 4.4 Step 4: Allocation of the support costs |
| 5 | 4.5.2 Allocation of the management activities. |
| 6 | 4.5.1 Allocation of the business primary activities. |
| 7 | 4.5.3 Allocation of the Network/CFO Cable activities |
| 8 | 7.10 Allocation of Network Activities |
| 9 | 6.2 Allocation of IT constellations |

The overall objective of the model is allocating all the costs present in the cost base into the ABC products, products which have been defined by REG.

The cost base constitutes the starting point of the model and it is discussed in chapter 3 "Cost Base".

Further, the model allocation process can be subdivided into three main streams, ABC, IT and Network, which can be clearly distinguished in the figure by its color code (see the legend in Figure 2).

The ABC stream has as objective to allocate all costs that are not part of the Network or IT streams towards the ABC products. This allocation flow can be divided in 5 steps:

- The first step consists of the process of regrouping all costs in, on the one side "cost pools" and on the other side "cost center groups", as it will be explained under the paragraph 4.1"Step1: Costs regrouping" of this document.
- The second step consists of allocating certain costs directly to the products. See paragraph 4.2 "Step 2: Allocating costs directly to the products" for complete details.
- The third step consists of allocating the remaining costs to the activities, as detailed under paragraph 4.3 "Step 3: Allocating costs to activities".
- The fourth step consists of allocating the support costs to either the primary activities, the management activities, the Network flow or directly to the products. Paragraph 4.4 "Step 4: Allocation of the support costs" describes this stage in detail.
- The fifth step consists of allocating the primary and management activities to the products. Refer to paragraph 4.5 "Step 5: Allocation of the primary and management activities to the products" for a comprehensive description.

The IT and Network streams, although having completely separated CAPEX basis, both share a common OPEX source since in the current organisation there are no specific cost centers for IT and non IT operational costs. Therefore, the first action to tackle is the distribution of these aggregated costs into their respective IT and Network components. Regarding the Network OPEX costs, this "Network&IT OPEX de-aggregation" stage also delivers a further division of the Network related OPEX costs into expenses contributing to "Network activities" and expenses directly attributable to

the Network. The detailed process followed to achieve such de-aggregation is explained on paragraph 5 “Network&IT OPEX de-aggregation”.

Once this distinction has been made, the IT and Network streams can be dealt with independently.

The IT stream, is made of two steps in the model:

- The IT delivery module processes the IT specific CAPEX and OPEX costs and distributes them into the IT constellations. The full description of this step can be found under the paragraph 6.1 “IT delivery”.
- The allocation of the IT constellations to the different products (and at some occasions to activities). See paragraph 6.2 “Allocation of IT constellations” for a comprehensive explanation on the subject.

The Network stream has also been squeezed into two main consecutive stages:

First, the allocation of the Network Primary Activities to the network objects (technology cost pools, network elements, network functions) presented in section 7.10, and secondly the allocation of the network objects following the logical network layers to network services and eventually to the ABC products elaborated in the Sections 7.1 to 7.9 .

In order to keep the allocation complexity (number of steps) within manageable limits , the implementation design of the model in the INCA tool encapsulates a portion of the allocation streams in a separated INCA submodel; only the end-to-end allocations relating to the encapsulated input objects to the encapsulated output objects are inserted in the remaining model allocations to form a smaller integrated model (also referred to as top-model).

# 3 Cost Base

## 3.1 Périmètre des coûts inclus dans le modèle

### 3.1.1 Coûts inclus dans le modèle

Les coûts inclus dans le modèle sont les comptes de charges opérationnelles, c'est à dire les comptes 60 à 64 de la comptabilité générale, ainsi qu'une partie des comptes 66 et 69.

Le compte 60 "achats de matériel" comprend principalement des achats de matériel télécom (modem ADSL, terminaux, câbles, cartes, mobiles, …) et de fournitures (cpe, …) et des variations de stocks.

Le compte 61 "services et biens divers" comprend principalement les charges liées au trafic (notamment les redevances d'interconnexion) et les charges de maintenance, d'énergie, de locations, de publicité, de représentation, de consultants, de déplacements.

Le compte 62 correspond aux charges de personnel.

Le compte 63 correspond aux dotations aux amortissements, aux provisions et aux réductions de valeur.

Le compte 64 regroupe les autres charges opérationnelles, parmi lesquelles se retrouvent principalement les éléments suivants : abandons de créances, taxes locales et précompte immobilier.

Le compte 66 reprend le montant de charges exceptionnelles correspondant au montant PBS (Pension Back Service) accepté par l'IBPT dans le cadre de l'offre BRIO.

Le compte 69 reprend le montant d'affectations et prélèvements correspondant à la participation du personnel dans le bénéfice de l'exercice (bonus collectif).

Par ailleurs, le compte 72 – "Production immobilisée" vient diminuer la base des coûts pour annuler les charges liées à la production immobilisée et éviter un double comptage avec les charges d'amortissements correspondantes.

Au périmètre issu de la comptabilité générale s'ajoute le coût moyen pondéré du capital (WACC) de 11,2% .

### 3.1.2 Coûts exclus du modèle

Les autres charges sont exclues du modèle. Il s'agit des comptes 65 à 69 de la comptabilité générale, excepté une partie des comptes 66 et 69.

Certaines charges sont exclues car considérées comme n'ayant pas de lien de causalité avec les produits et les activités. C'est le cas des charges exceptionnelles qui n'ont pas été reprises dans l'offre BRIO (compte 66) et des charges fiscales (comptes 67 et 68).

D'autres charges sont exclues du fait qu'elles sont déjà prises en compte dans le coût moyen pondéré du capital. Il s'agit des charges financières (compte 65) et des charges de dividendes (compte 69).

## 3.2 Organisation

Like in 2009 the Mobile business activities and Fixed Line activities were operated under separate legal entities (Mobile Carrier Services – MCS, Fixed Line Services – FLS), and the personnel from both entities was structured in a converged functional organisation. Costs of both entities are completely separated , and reported in separate accounting systems. For this model only the costs of Belgacom SA are concerned. In 2009 the organisation has been kept quite stable after the new organisation put in place in 2008. The only changes relate to the enlargement of the E- Business activity. In 2008 there was only one E-Business CCG within Sales whereas in 2009 a new department was created within Consumer Business Unit (CBU) named E-Business Services covering several CCG's. Also within Enterprise Business Unit (EBU) a new department was created named "Operational Excellence" and the COR/Large and SME market departments were reduced to COR and SME.

Also the activity "Investigators" moved within Staff and Support from Corporate Internal Services to Secretary General.

As a reminder, in January 2008 a complete new organisation was put in place in order to work more as an integrated Group and to propose to Customers always better convergence solutions. This new organisation is built in a matrix form meaning that some responsibles will have an organisational (fixed-mobile) responsibility and a hierarchical responsibility in the originating company.

The organisational structure is laying upon 4 pillars:

- Consumer Business Unit (CBU) has the responsibility over the residential customers
- Enterprise Business Unit (EBU) has the responsibility over the professional customers
- Service Delivery Engine (SDE) centralises network and IT services
- Staff and support (S&S) groups all horizontal functions sustaining the Group activities

Although this is a complete new structure there was no impact on the costs for the Belgacom SA model as the subsidiaries kept their legal entity structure.

On October 1, 2008 there has been an integration of the Staff and Support personnel of Mobile, Telindus and Skynet meaning that involved personnel received a Belgacom contract and as such salary costs were in the Belgacom books of accounts. However re-invoicing was made for activities performed to these subsidiaries.

For information, find below the organisation as it was put in place on January 1, 2008:

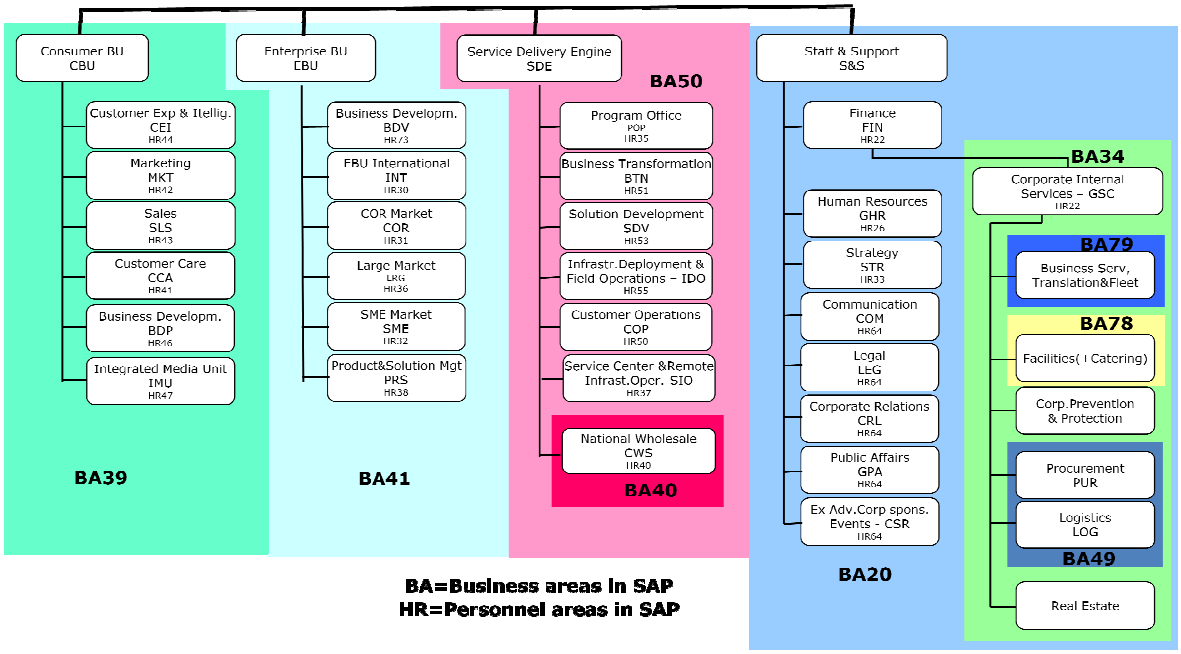



**Figure 4**

- This organisation re-introduces a clear split between the residential and professional customers by creating the division Consumer and Enterprise Business Units.
- The Service Delivery Engine brings together Network and IT services (formerly named ITN) , Customer Operations (COP), Program Office (POP) and Carrier Wholesale (CWS). The content of these blocks remains the same meaning that network and IT services are treated within the Network / IT flow whereas CWS, POP & COP are treated within ABC with the exception of COP costs for network cables that are Network / IT related.
- Within Staff & Support the content (FIN, GHR, STR, LEG, COM….) remains the same but a new department was created called Corporate Sponsoring and Events ( CSR ) grouping all sponsoring activities. Corporate Internal Services grouping internal services like Fleet, Facilities, Prevention&Protection, Procurement….fall under the responsibility of FIN, the Financial department.

## 3.3 Répartition du périmètre des coûts entre le module ABC et le module Network / IT

Le périmètre des coûts est réparti par le département REG entre des flux d'allocation de coûts réseau, IT et ABC en s'assurant que les données de coûts issues de SAP soient complètes et ne contiennent pas de doublons. Comme mentionné dans la description générale, le flux Network / IT alloue tous les coûts et investissements en matière d'informatique (à l'exception de l'activité « End-User Support ») et de réseau alors que le flux ABC alloue tous les autres coûts et investissements.

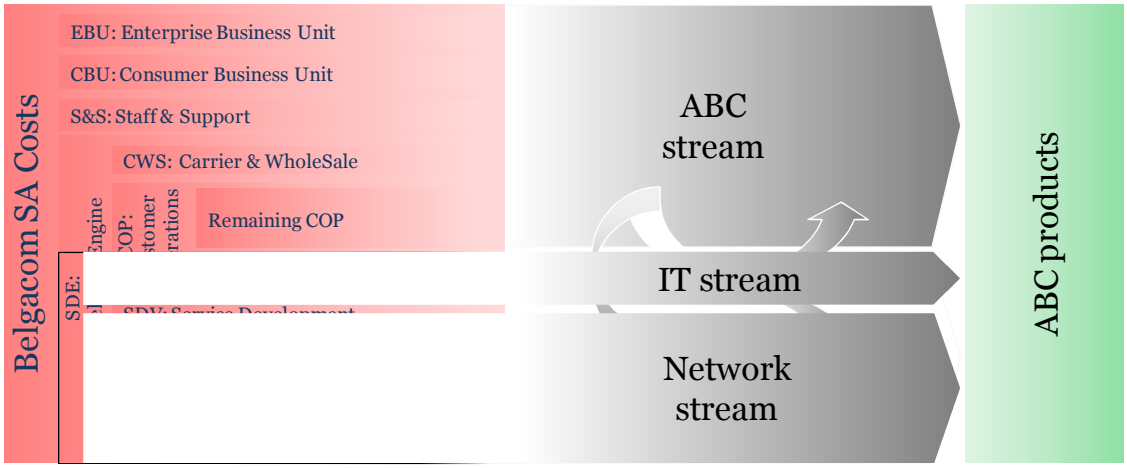



**Figure 5**

La répartition du périmètre des coûts entre les flux Network / IT et ABC est réalisée comme suit:

- The following departments within SDE are treated within the Network / IT flow: IDO ( Infrastructure Deployment and Field Operations ), BTN ( Business Transformation ), SDV ( Solution Development ), POP (Program Office) and SIO (Service Center & Remote Infrast. Operations) with the exception of Product Reference Data which is ABC related.
- Les coûts du département COP (Customer Operations) sont répartis entre les flux selon leur origine: les coûts relatifs à la construction et à l'entretien du réseau de câbles cuivres (les câbles fibre optique faisant partie de IDO donc du flux Network / IT) sont traités comme coûts Network tandis que tous les autres coûts de COP (activités client) sont traités comme coûts ABC. En règle générale, cette répartition est effectuée sur base d'une analyse des centres de coûts de COP. Certains centres de coûts, appelés centres de coûts « mixtes » (principalement management & support staff, operational excellence, field area management), comprennent à la fois des coûts réseau (Network / IT) et des coûts client (ABC) et une analyse plus détaillée est alors nécessaire:

  Le matériel est réparti entre les flux ABC et Network / IT sur base des cost pools (matériel réseau = Network / IT, autre matériel = ABC).

  Les réductions de valeur sur stock sont réparties entre les flux ABC et Network / IT sur base des classes de stock sous-jacentes tandis que les réductions de valeur sur créances relatives à des dégâts causés ou changements demandés par des tiers à l'infrastructure réseau sont traitées par le flux Network / IT.
- Les provisions relatives aux taxes sur équipements télécom qui sont enregistrées au niveau de SDE Mgmt sont réparties entre les flux sur base des classes d'actifs sous-jacentes.
- All other costs, not mentioned above are treated within the ABC flow namely the divisions CBU (Consumer Business Unit) and EBU (Enterprise Business Unit), CWS (Carrier Wholesale) and Staff & Support. The Staff & Support division comprises different departments: STB (Services to Business) includes Headquarters, Legal, CSR (Corporate Sponsoring and Events), COM, Public Affairs, Secretary General and CRL (Corporate Relations). Then we have departments like Finance, Group Human Resources, Strategy and

finally GSC (Corporate Internal Services) for departments like Real Estate, Business Services, Facilities, Prevention & Protection, CSM (Corporate Sourcing & Supply Change).

- En ce qui concerne les investissements (amortissements et coût moyen pondéré du capital), la répartition entre les flux ABC et Network / IT est effectuée sur base d'une analyse des classes d'actifs: les actifs IT et réseau enregistrés au niveau de la division SDE sont traités dans le flux Network / IT tandis que tous les autres actifs (bâtiments, installations énergie, CPE,…) sont traités dans le flux ABC.

## 3.4 Assets revaluation

### 3.4.1 Network assets revaluation methods

#### *3.4.1.1 Methods used to revaluate the network assets*

The regulatory framework clearly states that the cost accounting systems of operators being declared as dominant on relevant markets must be set based on Current cost accounting for the network costs.

The network & IT flows within the top down model 2009 calculate the current costs for the network related assets. Current costs have been computed as explained hereafter.

There are five methods to evaluate the current value of the network: reassessment of the current inventory, price indexation, by default "keep everything as it is", index based on a fixed PPC and, as described in a subsequent section, regulated cost price based. For old assets concerning technology still in service we use a new method based on a fixed PPC2007. Each of these methods requires its own set of inputs. It is mainly the availability (or lack) of input which dictates the choice of the method. Nevertheless each method has its advantages and disadvantages with respect to the others.

The inventory and price indexation methods assume that network departments replace the equipment of its assets by equivalent equipment. The notion of equivalent is quite fuzzy. An engineer would tell you that over time there are always more functions integrated in new equipment and that they are always more cost-effective. It makes the comparison between different generations of equipment difficult. The notion of equivalent has therefore been addressed through the term Modern Equivalent Asset (MEA). The assets must be replaced by their MEA. The MEA is the replacement cost of the technology expected to be in place within the planning horizon. Note that this notion takes into account the introduction speed of a new technology in the network. If network departments plan to have replaced 50% of an old technology by a new one within the planning horizon, it makes no sense to simulate the costs with higher percentages because the planning takes into account the availability of the resources to carry out the work.

Find hereafter the rules that have been used:

- Technology still in procurement: use current price, e.g. SDH equipment, DWDM equipment

- Technology to be replaced within the planning horizon: use current price of the modern equivalent asset, e.g. some PDH line system equipments are replaced by SDH equivalents.
- Obsolete technology: use current price of the modern equivalent asset, e.g. the HDSL technology for high speed services on copper replaces the less cost-effective HDB3 technology.
- Technology grouped in : those assets will be revaluated by another asset concerning the same technology
- Old technology not anymore in service : those assets are set out of scope and will not be revaluated
- Old technology still in service ( in maintenance mode ) ; those assets are revaluated by an index method based on a fixed PPC instead of index or inventory method . Old assets revaluated by keep will keep the CAV value as GRC
- ATM technology : use the BIPT regulated cost price to value the switching component of asset .

#### 3.4.1.1.1 Price Indexation

This is the most straightforward approach, provided historical costs are available. The investments for each year (from 1981 on) are multiplied by the price index of the year concerned. The price index is equal to the ratio of the current price to the historical price of the equivalent service/product.

The method is refined by defining price indexes depending on the nature of the cost. This is particularly true when costs of a different nature experienced a different price evolution. Three different types of price indices have been defined: the labour index, the indices for services delivered by external companies and the material index. Note that indices for services supplied by external companies vary according to the asset involved. For example, services supplied by external companies related to cable assets, are in fact outsourced labour costs for trenching and cable installation. In such case, a labour index has been applied. Other external services less labour intensive are resulting in other price indices, such as a fibre cable index.

#### 3.4.1.1.2 Inventory

This is the best method to reflect accurately the price of assets currently in service in the network. The revaluation is merely performed by multiplying the volume of each specific type of equipment currently deployed in the network by its average current unit cost. The current unit costs are based on the prices defined in the current frame agreements we have with our suppliers.

In terms of inputs it is the most demanding method. It requires an extensive inventory of equipment.

The inventory method has been used for data, switching, transmission and access equipment. Switching data is based on the inventory reports delivered by the engineering service. Transmission

and access data are obtained from the technical database ITR. Data inventories are obtained from field operational tracking sheets.

#### 3.4.1.1.3 Keep as it is.

The "keep as it is" method is merely what its name says. We keep the price we have in the historical accounting books. This method is only valid for costs with a very short depreciation period or for software intensive products. For the latter we assume that on the one hand software development is labour intensive but on the other hand the rapidly evolving programming environment improves the productivity compensating for the higher labour cost. This results in a stable software price. Another practical reason to select the "Keep as it is" method is the amount booked on the asset. If this amount is small, the method has also been applied. In this particular case, the effort to collect all the information about the cost evolution outweighs the impact on the service costs.

#### 3.4.1.1.4 Index Based on a fixed PPC

Old technology still in service ( in maintenance mode ) ; those assets are revaluated by an index method based on a fixed PPC

If Belgacom has done some investments for keeping those technologies in service, we take those investments also into account.

- Formula :

$$GRCyearN = \left[\left(GRCyearN - 1\right) * \left(1 + fixedPPC\ 2007\right)\right] + investment\ sYearN$$

### *3.4.1.2 TAM: Tilted Annuity Method*

#### 3.4.1.2.1 Theory

The purpose of this section is to describe how the Tilted Annuity Method (TAM) is finally implemented in the Current Cost Accounting (CCA) based network cost model 2009.

As from the 2003 model, Belgacom implemented the formula that BIPT suggested.

$$ACC\mu Y = F1, \mu Y \times F2, \mu Y$$

where

$F1, \mu Y = (GRC\mu Y, begin + GRC\ \mu Y, end)/2$

$F2, \mu Y = \sqrt{}(1 + WACCY) \times [\ 1 - (1 + APC\mu)/(1 + WACCY)\ ] / [1 - [(1 + APC\mu)/(1 + WACCY)]\ \hat{}\ L\mu]$

and where

- ACCμY: Annual CAPEX Cost of asset μ and year Y. It includes the annual depreciation and the cost of capital.

- WACCY: WACC of year Y.
- GRCμY, begin: Gross Replacement Cost of asset μ at the beginning of year Y.
- GRC μY, end: Gross Replacement Cost of asset μ at the end of year Y.
- APCμ : Annual Price Change of asset μ .
- Lμ : Lifetime of asset μ.

Remarks:

The formula assumes that:

- In the beginning of year Y was invested in an asset and that at the middle of each year of the lifetime of the asset revenues will be generated.
- The annual price change is constant over the lifetime of the asset.
- The asset price does not evolve during the year, i.e. price changes only appear at January 1st.

The factor F1, μY represents the value of asset μ in the middle of year Y.

- The purpose of the arithmetic average of GRCμY, begin and GRC μY, end is to take into account investments or disinvestments of asset μ during the year Y.
- The arithmetic average of GRCμY, begin and GRC μY, end does not filter out the price evolution of the asset μ during the year Y.

The difference between the formula of BIPT and the formula of Exhibit 5, p. B3. of the white paper of Analysys is the factor $1 / \sqrt{(1 + APC\mu)}$, which filters out the price evolution of the asset μ during the year Y.

The gross replacement cost (GRC) of assets at any particular point in time is calculated as the sum over all assets owned by the business at that point in time, of the investment that would be necessary to purchase and install new replacements for those assets at that point in time (using modern equivalent assets if the existing assets are no longer available or efficient). The replacement value of assets, used for costing purposes should always include the gross value of every asset in use by the business (the current cost of replacing it with a new, possibly modern equivalent asset), irrespective of the history of depreciation of that asset in any financial accounts to date.

Lμ : Lifetime of asset μ, i.e. the expected useful lifetime of the new asset μ.

The depreciation period and the expected useful lifetime of a new asset are defined differently. The depreciation period refers to accounting. The expected useful lifetime of a new asset does not refer to accounting. It refers to the period that is expected that a new asset will be used. The main factor to determine the expected useful lifetime of a new asset is the evolution of the associated operational costs, i.e. the asset will be replaced when operating becomes too expensive. Another factor is the appearance of new technology: if in the future new technology will come-up it could be that the asset will be replaced (even if it is not too expensive to operate).

#### *3.4.1.3 Regulated cost price based asset valuation.*

In 2008 , the valuation of the ATM asset has been aligned with the BIPT BROBA model 2008.

In the ATM network architecture two levels of ATM switches are present : the local ATM switch , and the area level ATM switch, the area level nodes correspond to the interconnect areas used in BRIO, BROBA and BROTSOLL . The function of the ATM network is to provide switched Virtual Paths between a port of a local switch and another port of the same local switch (local VPs) or of an area switch (nonlocal VPs). For Virtual Path switching two equipments are involved : the ATM switches themselves (also called switching fabric) , and the trunk interfaces to interconnect distant ATM switches . In order to access configured Virtual Paths, access interface equipments are needed at the border of the local or area switches.

The ATM asset contains the investment costs of the equipments delivering switched Virtual Paths (the ATM local switches , the ATM area switches, the ATM trunk interfaces for the backhaul links between the ATM switches) and the equipment delivering access to VPs (ATM interfaces for the ATM tributaries or clients).

The costing of the asset is thus decomposed in the costing of the VP switching equipment (backbone ATM equipment) and in the costing of the access to VP equipment .

#### *3.4.1.4 CAPEX Costing of the VP switching component*

This costing is based on the inventory of switched Virtual paths (local VPs, and non-local VPs) configured on the Belgacom ATM network . Each virtual path is valued using the BIPT BROBA VP tariffs 2008 . Indeed , the BIPT tariffs are cost based and are established using a bottom-up costing model.

However, the BIPT tariffs being full cost tariffs , they integrate the ATM CAPEX, the ATM OPEX , the backhaul transmission costs (links between the ATM trunks interfaces) , the IT costs and the overhead costs. Applying directly the BIPT BROBA tariffs would incorporate costs other than ATM CAPEX costs in the ATM asset. Therefore the costing is conducted in 3 steps:

The first step eliminates the IT , the overhead and the backhaul costs component from the BIPT tariff computing a tariff structure free of IT/overhead/backhaul. The second step applies this tariff to the inventory of VPs yielding ATM costs containing ATM CAPEX and ATM OPEX. The third step calculates the OPEX costs corresponding to the network equipment amounts allowing the VPs of the inventory and substracts this cost from the ATM CAPEX&OPEX . The end result is an estimation of the pure CAPEX cost for all configured VPs .

There are many advantages in using this approach; first , the BIPT BROBA tariffs per VP value complex VP characteristics like Quality of Service, Peak Cell Rate / Sustained Cell Rate ratio, distance aspect (local , nonlocal VPs) and VP capacity. Secondly, the BIPT tariffs also value other material costs directly involved in ATM like cabling investment costs and ATM management platform investment costs.

#### *3.4.1.5 CAPEX Costing of the ATM access component*

The CAPEX costing of the ATM access component is based on the detailed inventory of access lines ending-up in ATM switches; the source of this inventory is the ITR infrastructure inventory system. Only the tributary lines are considered in this inventory as the accesses for ATM interswitch links (trunks) are already valued in the VP switching component.

The same unit costs of ATM ports as in the BIPT Bottom-Up BROBA model are applied on this inventory depending on the capacity of tributary lines to come to the CAPEX costs of the ATM access component.

# 4 ABC stream

## 4.1 Step1: Costs regrouping

Belgacom enregistre les coûts d'une part sur un compte défini dans la comptabilité générale et d'autre part sur un centre de coûts défini dans la comptabilité analytique. Cette étape a pour objectif d'agréger ces données afin de simplifier la manipulation de ces données.

Deux types de regroupement sont effectués :

- celui des 538 comptes de la comptabilité générale en 154 cost pools et
- celui des 492 centres de coûts en 247 groupes de centres de coûts.

Un **cost pool** est un groupe de coûts qui ont des caractéristiques communes et sont issus de la même famille de nature de coûts.

Dans le cas de ressources matérielles, seront regroupés les coûts qui remplissent une fonction similaire. Ainsi, le cost pool "Dépenses en formation" regroupe les coûts de formations organisées par Belgacom pour son staff, les coûts de séminaires extérieurs et les coûts de magazines, de livres et de documentation liés aux formations.

En ce qui concerne les ressources humaines, seront rassemblés les coûts des travailleurs qui ont le même profil. Ainsi, le cost pool "Level S" reprend les salaires des employés de niveau S (force de vente) ainsi que les primes et contributions allouées à ces travailleurs.

Les coûts repris dans un même cost pool ont une relation de causalité identique avec les activités ou les produits auxquels ils peuvent être attribués, ils ont le même "resource driver".

Un **groupe de centres de coûts** regroupe des centres de coûts qui ont des caractéristiques communes et qui réalisent des activités similaires. Par exemple, les centres de coûts représentant un point de vente particulier sont repris sous le groupe des centres de coûts des points de vente en général (p.ex. le point de vente de Wavre appartient au groupe de centres de coûts "points de vente" car tous les points de vente réalisent le même type d'activités et peuvent donc être regroupés au sein d'un même groupe).

Chaque groupe de centres de coûts consomme les différents cost pools. En effet, le point de vente de Wavre emploie des employés de niveau S. Dès lors le groupe de centres de coûts "points de vente" regroupera la « consommation » en employés de niveau S de l'ensemble des points de vente.

Ainsi, les combinaisons cost pool/groupe de centres de coûts forment des groupes de ressources. Ce sont ces groupes de ressources qui constituent la base de coûts du modèle, et plus particulièrement du flux ABC.

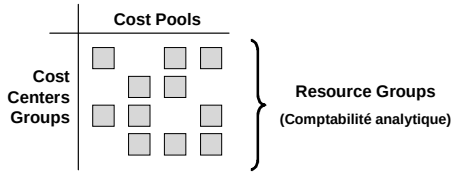



**Figure 6: Groupes de ressources**

## 4.2 Step 2: Allocating costs directly to the products

The second step consists of allocating costs directly to the products to which they are related.

### 4.2.1 Material out of stock

The MOS is divided into two main categories: CPE and network material.

- For the CPE, there exists in general a 1-to-1 relationship between the costs and the products to which they are related. Each account name refers to a specific type of material so that costs can be allocated to the related product.
- For the network material, the costs are allocated to the products following their descriptions and GL account.

### 4.2.2 Services and other goods

The services and other goods can be classified into 4 major categories: interconnection costs, commissions, infrastructure and other charges:

- Interconnection :

  Two cases are possible for allocating these costs to the respective products:

  - The nature of the interconnection fee allows allocating the total cost pool directly to the related product (67%). In this case no allocation key is used.
  - Cost pools representing 33% of total interconnection costs are allocated on different products pro rata the interconnect invoices paid by Belgacom to the different OLO's. This information is coming principally from CBU, EBU and CWS financial reporting.

- Commissions paid to third parties
  - The nature of the commission allows allocating the total cost pool directly to the related product. In this case no allocation key is used.
  - Some cost pools group commissions for different products. The allocation is made pro rata the commissions paid to the indirect sales channels on the different products sold by them.

- Infrastructure:

  Here we distinguish on one side the costs for the international infrastructure (93,8%) and on the other side the costs for the national infrastructure (6,2%). For the international infrastructure these costs are allocated to the products (data BES, BWS, internat. satellite) either directly or following a detailed analysis done by the EBU division. For national infrastructure these costs are mainly allocated to the CPE Other product on the basis of the outsourced invoices within the COP department and linked to customers' installations.

### 4.2.3 Remuneration, social security costs and pensions.

Within some departments and cost center groups, the remuneration costs could be allocated directly to the products. This is especially the case for activities within Staff and Support on behalf of the affiliates. Due to the integration of Staff and Support personnel of Mobile, Telindus and Skynet this direct allocation is becoming more important. These costs are booked on the product "Subsidiaries&Exernals".

### 4.2.4 Depreciation, write-offs, provisions for liabilities and WACC

These costs are allocated to products on the basis of the underlying assets. Mainly they are allocated to the CPE Other, Fast Internet and iDTV.

## 4.3 Step 3: Allocating costs to activities

In the ABC flow three different types of activities appear:

- The **primary** (Business and Network/CFO Cable) activities give directly an added value to the products. They cover:
  - Strategy, product and market management
  - Fulfilment: from sales, order handling to delivery
  - Service assurance: from services after sales to repairing
  - Billing and collection
  - Copper work for customers and maintenance&repair of cable.
- The **management** activities are essential for a good functioning of the company. They cover:
  - Human resource management
  - Financial management
  - Administration and general support
  - Operational excellence
- The **support** activities covering:
  - Supply chain and facilities services

These 10 processes are divided into 29 sub-processes which on their side contain 96 activities. It is on these activities that the "indirect" costs will be allocated. Cost center groups, cost pools or the combination of both determine in which activities they are involved.

In general we can say that there are 5 methodologies to allocate the indirect costs:

- *Objective measurements going directly to the activity*
  - On the basis of the work hours performed by SDE COP people for each corresponding activity. The reporting system used is CLARA. Those work hours have been translated into Dispatching Unit (DU) by taking into account standard time per activity as well as per product.
  - On the basis of BCI cases handled by the call center operators in CBU/CCA. The BCI system does not only register the sales by product but also the cases by type, mapped to the ABC subprocesses such as order handling, non-billing related service assurance and billing-related service assurance.
  - On the basis of a BAIN field study registering the activities in CBU/DIR (shops).

- The cost pool "salaries" and the personnel costs linked to this category of employees are allocated to the activities thanks to this methodology.

➢ *Objective measurements of the FTE input*

- Based on the number of FTEs (full time equivalents) working on a certain activity. For the need of the 2009 ABC flow, we used FTE templates per cost center group or cost center for which each responsible had to fill in the number of FTEs – per worker's category- performed on the activities linked to their cost center or cost center group . The ABC flow takes the annual average number of FTEs from SAP HR database.
- The cost pool "salaries" and the personnel costs linked to this category of employees are allocated to the activities thanks to this methodology.

➢ *Assignment based on a cost pool*

In certain cases, there is a direct link between a cost pool and an activity: e.g. cost pool 6400 "tax fleet utility" goes directly to the activity 6.4.1 "Manage, maintain and repair utility vehicles".

➢ *Assignment on the combination cost center group and cost pool*

- The combination cost pool 6010 "Network materials" and CCG 78400 "GSC-IFM-BTS-Building & Technical Services" goes to the activity 6.2.2 "Manage, maintain & repair buildings".
- The combination cost pool 61070 "waste" and CCG 49480 "CSM-LOG-Waste mgmt" goes to activity 6.1.7 "Manage waste and scrap".

➢ *Assignment on the basis of a specific analysis allowing to establish a causal relationship*

E.g. energy costs are distributed on the basis of a logical analysis between:

- 6.2.2 "Manage, maintain and repair buildings"
- 6.3.1 " Manage the power chain for telecom infrastructure".

## 4.4 Step 4: Allocation of the support costs

This step has as objective to allocate the support costs to:

- Primary and management activities
- Directly to the products
- The Network / IT flow

In these costs we find:

- The majority of the costs re. GSC ( Corporate Internal Services ) department
- The majority of the costs re. CSM department
- Other support costs (activities provided by other divisions like FIN, CBU, EBU )

The support department GSC provides support to all the Belgacom divisions and to itself while other divisions can also have support activities but then only for themselves.

The costs of the support activities are allocated following a cascade principle. There is no mutual assignment. Once the cost of a support activity has been allocated, this activity can no more receive any other cost.

### 4.4.1 Allocation of the ABC IT support costs.(process 7)

The ABC IT costs relate mainly to "End Users Support costs" and are sent to the IT_Constellation flow for further treatment.

### 4.4.2 Allocation of the logistics activities (process 6)

The logistics activities of process 6 are principally realised by the GSC and CSM departments. The logistics activities carried out by other divisions are allocated on the products/activities of the concerned division.

#### *4.4.2.1 Allocation of building costs*

These activities are mainly delivered by the GSC department.

The database "Speedikon" manages the space occupied by each division and this for each type of building. The square meters are classified by:

- *Room categories*: housing, office, parking, shop, storage, technical building, technical telecom, unusable, workshop.
- *Type of room category*: e.g. for the storage category, we distinguish the following 3 types: archives, reserves and warehouse.

Based on this information, each square meter is allocated to one of the ABC categories following the causality principle. The ABC categories will be the basis for allocating the cost of buildings to intermediate (other activities) and final objects (products) of the cost model.

#### *4.4.2.2 Allocation of fleet costs.*

The FMS database gives the number of vehicles of Belgacom SA in 3 categories: management, sales and utility cars and this for each division. Information on fuel consumption is also available. The general key is the number of vehicles per category per activity within a division.

#### *4.4.2.3 Allocation of other facilities costs.*

The activities assigned in this step concern energy, moves, internal mail distribution, etc.

*Moves*

The activity "moves" is allocated following the number of office moves within a division.

*Internal mail distribution*

This activity is assigned to activities using this kind of services (mainly the activities defined as office activities). The number of FTE carrying out these activities is the key.

*Catering*

Catering is allocated over the activities using the catering service (mainly the activities defined as office activities) using the number of FTE carrying out these activities as key.

*Print and copy shops*

This activity is assigned to the activities using the different print and copy shop services (outgoing invoices excluded). The key can either be the number of transactions (mailings) registered by the print shop of Libramont, the value of the purchase order or the number of FTEs using these activities (copy shop costs).

*Energy telecom*

The energy costs feeding the telecom equipments are allocated to the concerned divisions depending on the consumption measured in Mwh or amperes

#### *4.4.2.4 Allocation of the supply chain activities costs.*

These activities are allocated in 5 steps. Sometimes the supply chain costs can also be assigned directly to a product as there may be a causal relationship.

*The first allocation refers to: waste grid*

The waste costs are divided over the different concerned divisions – SDE/COP (for telecom waste), CSM (waste linked to the supply chain) and GSC (office waste)

The cost for SDE/IT&N goes to the Network / IT flow. The CSM costs are mainly allocated to the CPEs and iDTV based on the number of picking lines. The other costs of GSC are assigned to office activities depending on the number of square meters used.

*The second allocation refers to: purchasing and APC grid*

For the purchase activity, the initial key is the purchase/contract order values per division and per SOG type; the secondary key is based on the combined cost of this SOG with the activity and/or product associated within the division.

For the treatment and follow-up of invoices, the primary key is the number of invoices weighted in lines per division and per SOG type; the secondary key is the combination with the activities and/or products of the division.

*The third allocation refers to: warehousing grid*

The activity linked to the warehouse management is allocated in function of the number of "picking" lines (as well as for the consumption materials and the goods transferred to other stores) per division and per good. The secondary key combines this with the activities and/or products of the division.

*The fourth allocation refers to: transport grid*

The activity linked to the internal distribution is allocated in function of the transported volumes and delivery destination (point of sales, secured area…)

*The fifth allocation refers to: cables and reverse logistics grid*

The activity linked to cables is allocated directly to the Network / IT flow.

The activity linked to the treatment of re-entries is allocated in function of the number of picking lines per good.

## 4.5 Step 5: Allocation of the primary and management activities to the products

In the fith and last step, primary and management activities are allocated to products. At this stage in the model all support activities have already been distributed and are as such included in the primary and management activities.

The REG department has defined a key for each activity/division combination. Such a key has been defined for every activity of the ABC dictionary taking into account the division executing this activity.

Wherever applicable, for certain activities, driver quantities have been calculated by taking into account specificity and complexity of each product (see below detailed descriptions).

Wherever necessary, connection volume is used as 2nd key for provisioning activities and subscription volume is used as 2nd key for repair activities (see below detailed descriptions).

Wherever necessary, revenue volume is used as 2nd key for certain activities.

### 4.5.1Allocation of the business primary activities.

These activities are part of the following processes:

#### *4.5.1.1 Process 1: Strategy, Product and Market Management.*

| Activity | Division | Driver |
|---|---|---|
| 1.1.1. Plan, develop and manage business | 20_FIN | Generic - Total costs per product |
| 1.1.1. Plan, develop and manage business | 20_GHQ | Generic - Activity product allocation |
| 1.1.1. Plan, develop and manage business | 20_STR | Generic - Total costs per product |
| 1.1.1. Plan, develop and manage business | 39_CBU | Direct |
| 1.1.1. Plan, develop and manage business | 41_EBU | Direct |

| | | |
|---|---|---|
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20_COM | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20_CRL | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20_CSR | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20_FIN | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20_GHQ | Generic - Activity product allocation |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20_GHR | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20_STR | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 20-LEG | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 34_MST | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 39_CBU | FTE per product |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 40_CWS | FTE per product // Rev per product |
| 1.2.1. Acquire, retain & stimulate customers (marketing) | 41_EBU | FTE per product |
| 1.2.1. Acquire, retain & stimulate customers (marketing) (communication costs) | 20_COM | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) (communication costs) | 20_CSR | BGC retail product portfolio turnover (terminating rates & BVAS out / DAS OLO revenues taken out) |
| 1.2.1. Acquire, retain & stimulate customers (marketing) (communication costs) | 20_GHQ | Generic - Activity product allocation |
| 1.2.1. Acquire, retain & stimulate customers (marketing) (communication costs) | 39_CBU | Com per product |

| | | |
|---|---|---|
| 1.2.1. Acquire, retain & stimulate customers (marketing) (communication costs) | 40_CWS | FTE per product // Rev per product |
| 1.2.1. Acquire, retain & stimulate customers (marketing) (communication costs) | 41_EBU | Com per product |

For staff & support divisions, costs are often allocated depending on the costs already charged to the products, independently of the subprocess, except in the case of the 1.2.1. activity, based on the turnover per product.

For SDE & customer divisions (CBU, EBU & CWS), costs are mainly allocated as follows :

- depending on the FTE's / revenues per product,
- on the basis of the communication costs per product,
- directly to one product,
- depending on the FTE's per product as 1st key and on the basis of revenue per product as 2nd key.

#### *4.5.1.2 Process 2: Fulfilment: activities going from sales, order handling to installation.*

| Activity | Division | Driver |
|---|---|---|
| 2.3.1. Sell products & services through indirect sales channels | 20_GHQ | Generic - Activity product allocation |
| 2.3.1. Sell products & services through indirect sales channels | 39_CBU | Sold volumes (IND) * sales time |
| 2.3.1. Sell products & services through indirect sales channels | 41_EBU | BCI & TNA TTVA |
| 2.3.2. Provide sales & info services in Points Of Sales | 20_GHQ | Generic - Activity product allocation |
| 2.3.2. Provide sales & info services in Points Of Sales | 39_CBU | Sold volumes (DIR) * sales time |
| 2.3.3. Develop & sell proposals for standard products or integrated solutions (including client visits) | 20_GHQ | Generic - Activity product allocation |
| 2.3.3. Develop & sell proposals for standard products or integrated solutions (including client visits) | 40_CWS | Bonus pay-out |
| 2.3.3. Develop & sell proposals for standard products or integrated solutions (including client visits) | 41_EBU | BCI TTVA |
| 2.3.4. Provide sales & info services through telesales or contact center (voice, fax, letter, e-mail) | 20_CRL | Sold volumes (CCA) * sales time |

| | | |
|---|---|---|
| 2.3.4. Provide sales & info services through telesales or contact center (voice, fax, letter, e-mail) | 20_GHQ | Generic - Activity product allocation |
| 2.3.4. Provide sales & info services through telesales or contact center (voice, fax, letter, e-mail) | 39_CBU | Sold volumes (CCA) * sales time |
| 2.3.5. Negotiate and establish BRIO/BRUO/BROBA/BROTSOLL agreements with operators / service providers | 20_GHQ | Generic - Activity product allocation |
| 2.3.5. Negotiate and establish BRIO/BRUO/BROBA/BROTSOLL agreements with operators / service providers | 40_CWS | Bonus pay-out |
| 2.3.6. Close presales, sales interactions and transactions about products & services through the website channel | 20_GHQ | Generic - Activity product allocation |
| 2.3.6. Close presales, sales interactions and transactions about products & services through the website channel | 39_CBU | Sold products (ECH) |
| 2.3.7. Sell DIS products & services through DIS channel | 20_GHQ | Generic - Activity product allocation |
| 2.3.7. Sell DIS products & services through DIS channel | 39_CBU | FTE per product |
| 2.4.1. Handle customer orders | 20_GHQ | Generic - Activity product allocation |
| 2.4.1. Handle customer orders | 39_CBU | Order handling CBU/EBU BCI cases |
| 2.4.1. Handle customer orders | 40_CWS | actions |
| 2.4.1. Handle customer orders | 41_EBU | Order handling EBU BCI cases |
| 2.5.1. Execute remote provisioning - Mass (COP-CRO-IAC) | 20_GHQ | Generic - Activity product allocation |
| 2.5.1. Execute remote provisioning - Mass (COP-CRO-IAC) | 50_SDE | working hours |
| 2.5.2. Execute remote provisioning - Prof (COP-EIS-PPC) | 20_GHQ | Generic - Activity product allocation |
| 2.5.2. Execute remote provisioning - Prof (COP-EIS-PPC) | 50_SDE | #configured nodes |
| 2.6.4. Dispatch, monitor and close provisioning work orders (not related to the cable) - Mass (COP-CFOx-IDC-MAS) | 20_GHQ | Generic - Activity product allocation |
| 2.6.4. Dispatch, monitor and close provisioning work orders (not related to the cable) - Mass (COP-CFOx-IDC-MAS) | 50_SDE | provisioning #DU |

| | | |
|---|---|---|
| 2.6.5. Dispatch, monitor and close provisioning work orders (not related to the cable) - Prof (COP-CFOx-IDC-PRF) | 20_GHQ | Generic - Activity product allocation |
| 2.6.5. Dispatch, monitor and close provisioning work orders (not related to the cable) - Prof (COP-CFOx-IDC-PRF) | 50_SDE | provisioning #DU |
| 2.6.6. Dispatch, monitor and close provisioning Cu splicing work orders related to the introduction cable (COP-CFOx-IDC-Cable) | 20_GHQ | Generic - Activity product allocation |
| 2.6.6. Dispatch, monitor and close provisioning Cu splicing work orders related to the introduction cable (COP-CFOx-IDC-Cable) | 49_CSM | provisioning #DU |
| 2.6.6. Dispatch, monitor and close provisioning Cu splicing work orders related to the introduction cable (COP-CFOx-IDC-Cable) | 50_SDE | provisioning #DU |
| 2.7.1. Execute field provisioning (with or without customer visit) - Mass (COP-CFOx-MAS) | 20_CRL | provisioning #DU |
| 2.7.1. Execute field provisioning (with or without customer visit) - Mass (COP-CFOx-MAS) | 20_GHQ | Generic - Activity product allocation |
| 2.7.1. Execute field provisioning (with or without customer visit) - Mass (COP-CFOx-MAS) | 50_SDE | provisioning #DU |
| 2.7.1. Execute field provisioning (with or without customer visit) - Mass (COP-CFOx-MAS) | 79_BSF | provisioning #DU |
| 2.7.2. Execute field provisioning (with or without customer visit) - Prof (COP-CFOx-PRF) | 20_CRL | provisioning #DU |
| 2.7.2. Execute field provisioning (with or without customer visit) - Prof (COP-CFOx-PRF) | 20_GHQ | Generic - Activity product allocation |
| 2.7.2. Execute field provisioning (with or without customer visit) - Prof (COP-CFOx-PRF) | 50_SDE | provisioning #DU |
| 2.7.2. Execute field provisioning (with or without customer visit) - Prof (COP-CFOx-PRF) | 79_BSF | provisioning #DU |
| 2.8.4. Manage projects related to the provisioning of telecom & IT solutions - Prof | 20_GHQ | Generic - Activity product allocation |

| | | |
|---|---|---|
| 2.8.4. Manage projects related to the provisioning of telecom & IT solutions - Prof | 40_CWS | actions |
| 2.8.4. Manage projects related to the provisioning of telecom & IT solutions - Prof | 41_EBU | Direct |
| 2.8.4. Manage projects related to the provisioning of telecom & IT solutions - Prof | 50_SDE | #configured nodes |

We distinguish 6 different types of activities in this process:

- Activities linked to sales
- Activities linked to order handling
- Activities linked to remote provisioning
- Activities linked to field provisioning
- Activities linked to field provisioning (cable related included) support
- Activities linked to project management

For staff & support divisions, costs are often allocated depending on the costs already charged to the products, independently of the subprocess.

For SDE & customer divisions (CBU, EBU & CWS), costs are allocated as follows :

*1° Activities linked to sales*

The costs are mainly allocated as follows:

- based on the sales, often weighted with the average selling time,
- based on the TTVA (total transaction value of new contracts),
- based on the FTEs ,
- based on bonus.

*2° Activities linked to order handling*

The costs are mainly allocated as follows:

- based on the order handling BCI cases,
- based on relevant actions.

*3° Activities linked to remote provisioning*

The costs are mainly allocated as follows:

- based on configuration work hours taking into account standard time of treatment per product ,
- based on configured nodes taking into account complexity of configuration per product.

*4° Activities linked to field provisioning*

The costs are mainly allocated as follows:

- based on provisioning DUs.

5° Activities linked to field provisioning (cable related included) support

The costs are mainly allocated as follows:

- based on provisioning DUs,
- based on provisioning cable related DUs. This kind of activity cost is, rather than directly to ABC products, firstly sent to network objects and then via EUSs allocated to ABC products (see Network Stream chapter for details).

6° Activities linked to project management

The costs are mainly allocated as follows:

- directly to one product,
- based on configured nodes taking into account the complexity of configuration per product,
- based on relevant actions .

#### *4.5.1.3 Process 3: Service Assurance: fault handling and repairing*

| Activity | Division | Driver |
|---|---|---|
| 3.2.1. Receive and handle customer inquiries or complaints not related to billing | 39_CBU | After-sales CBU/EBU BCI cases |
| 3.2.1. Receive and handle customer inquiries or complaints not related to billing | 41_EBU | After-sales EBU BCI cases |
| 3.2.1. Receive and handle customer inquiries or complaints not related to billing | 40_CWS | actions |
| 3.2.1. Receive and handle customer inquiries or complaints not related to billing | 20_GHQ | Generic - Activity product allocation |
| 3.2.2. Provide Customer Service/SLA management – Prof | 40_CWS | actions |
| 3.2.2. Provide Customer Service/SLA management – Prof | 41_EBU | Direct |
| 3.2.2. Provide Customer Service/SLA management – Prof | 50_SDE | #customers |
| 3.2.2. Provide Customer Service/SLA management – Prof | 20_GHQ | Generic - Activity product allocation |
| 3.4.1. Execute fault handling & remote repair - Mass (COP-CRO-CHC) | 50_SDE | working hours |
| 3.4.1. Execute fault handling & remote repair - Mass (COP-CRO-CHC) | 20_GHQ | Generic - Activity product allocation |
| 3.4.2 Execute fault handling & remote repair - Prof (COP-EIS-RPC) | 50_SDE | working hours |

| | | |
|---|---|---|
| 3.4.2 Execute fault handling & remote repair - Prof (COP-EIS-RPC) | 20_GHQ | Generic - Activity product allocation |
| 3.5.1. Dispatch, monitor and close repair work orders (not related to the cable) - Mass (COP-CFOx-IDC-MAS) | 50_SDE | repair #DU |
| 3.5.1. Dispatch, monitor and close repair work orders (not related to the cable) - Mass (COP-CFOx-IDC-MAS) | 20_GHQ | Generic - Activity product allocation |
| 3.5.2. Dispatch, monitor and close repair work orders (not related to the cable) - Prof ( COP-CFOx-IDC-PRF) | 50_SDE | repair #DU |
| 3.5.2. Dispatch, monitor and close repair work orders (not related to the cable) - Prof ( COP-CFOx-IDC-PRF) | 20_GHQ | Generic - Activity product allocation |
| 3.5.3. Dispatch, monitor and close Cu splicing work orders related to the repair of cable network - (COP-CFOx-IDC-Cable) | 50_SDE | repair #DU |
| 3.5.3. Dispatch, monitor and close Cu splicing work orders related to the repair of cable network - (COP-CFOx-IDC-Cable) | 20_GHQ | Generic - Activity product allocation |
| 3.5.3. Dispatch, monitor and close Cu splicing work orders related to the repair of cable network - (COP-CFOx-IDC-Cable) | 49_CSM | repair #DU |
| 3.6.1. Execute field repair - Mass (COP-CFOx-MAS) | 50_SDE | repair #DU |
| 3.6.1. Execute field repair - Mass (COP-CFOx-MAS) | 20_GHQ | Generic - Activity product allocation |
| 3.6.1. Execute field repair - Mass (COP-CFOx-MAS) | 79_BSF | repair #DU |
| 3.6.2. Execute field repair - Prof ( COP-CFOx-PRF) | 50_SDE | repair #DU |
| 3.6.2. Execute field repair - Prof ( COP-CFOx-PRF) | 20_GHQ | Generic - Activity product allocation |
| 3.6.2. Execute field repair - Prof ( COP-CFOx-PRF) | 49_CSM | repair #DU |
| 3.6.2. Execute field repair - Prof ( COP-CFOx-PRF) | 79_BSF | repair #DU |

We distinguish 5 different types of activities in this process:

- Activities linked to customer inquiries or complaints not related to billing
- Activity linked to customer service and SLA management
- Activities linked to remote repair
- Activities linked to field repair
- Activities linked to field repair (cable related included) support

For staff & support divisions, costs are often allocated depending on the costs already charged to the products, independently of the subprocess.

For SDE & customer divisions (CBU, EBU & CWS), costs are mainly allocated as follows :

*1° Activities linked to* customer inquiries or complaints not related to billing
The costs are mainly allocated as follows:
- directly to one product
- based on after-sales BCI cases,
- based on relevant actions.

*2° Activities linked to* customer service and SLA management
The costs are mainly allocated as follows:
- directly to one product,
- based on relevant actions,
- based on number of customers treated.

*3° Activities linked to* remote repair
The costs are mainly allocated as follows:
- based on work hours taking into account standard time of treatment per product..

*4° Activities linked to* field repair
The costs are mainly allocated as follows:
- based on repair DUs .

*5° Activities linked to* field repair (cable related included) support
The costs are mainly allocated as follows:
- based on repair DUs,
- based on repair cable related DUs. This kind of activity cost is, rather than directly to ABC products, firstly sent to network objects and then via EUSs allocated to ABC products (see Network Stream chapter for details).

#### *4.5.1.4 Process 4: Billing and Collection*

| Activity | Division | Driver |
|---|---|---|
| 4.1.1. Receive and handle COB-related billing inquiries & complaints | 20_CRL | Billing BCI cases |
| 4.1.1. Receive and handle COB-related billing inquiries & complaints | 20_GHQ | Generic - Activity product allocation |
| 4.1.1. Receive and handle COB-related billing inquiries & complaints | 39_CBU | Billing CBU/EBU BCI cases |
| 4.1.1. Receive and handle COB-related billing inquiries & complaints | 40_CWS | Billed revenues per system |

| | | |
|---|---|---|
| 4.1.1. Receive and handle COB-related billing inquiries & complaints | 41_EBU | Billing EBU BCI cases |
| 4.2.1. Manage COB-related pricing reference data and non-usage / (re)rating / discounting processes | 20_GHQ | Generic - Activity product allocation |
| 4.2.1. Manage COB-related pricing reference data and non-usage / (re)rating / discounting processes | 50_SDE | Generic. Calculated cost per product for the whole of sub-processes 4.1., 4.2. & 4.3., to come to percentage of cost per product to use as key for this activity |
| 4.2.3. Manage printing, fulfilment and distribution of COB invoices | 20_GHQ | Generic - Activity product allocation |
| 4.2.3. Manage printing, fulfilment and distribution of COB invoices | 39_CBU | Billing cycle |
| 4.2.3. Manage printing, fulfilment and distribution of COB invoices | 78_IFM | Billing cycle |
| 4.2.4. Manage COB-related new billing developments | 20_GHQ | Generic - Activity product allocation |
| 4.2.4. Manage COB-related new billing developments | 39_CBU | Billing cycle |
| 4.2.5. Manage and control COB-related billing related operations & financial flows | 20_FIN | Generic. Calculated cost per product for the whole of sub-processes 4.1., 4.2. & 4.3., to come to percentage of cost per product to use as key for this activity |
| 4.2.5. Manage and control COB-related billing related operations & financial flows | 20_GHQ | Generic. Calculated cost per product for the whole of sub-processes 4.1., 4.2. & 4.3., to come to percentage of cost per product to use as key for this activity |
| 4.2.5. Manage and control COB-related billing related operations & financial flows | 39_CBU | Generic. Calculated cost per product for the whole of sub-processes 4.1., 4.2. & 4.3., to come to percentage of cost per product to use as key for this activity |
| 4.2.5. Manage and control COB-related billing related operations & financial flows | 40_CWS | Billed revenues per system |
| 4.2.6. Manage and control the DIMS data | 20_GHQ | Generic - Activity product allocation |
| 4.2.6. Manage and control the DIMS data | 39_CBU | Direct |
| 4.2.7. Manage and control the Soccabis data | 20_GHQ | Generic - Activity product allocation |
| 4.2.7. Manage and control the Soccabis data | 39_CBU | Soccabis products' revenues |
| 4.3.1. Prevent, investigate & detect COB-related customer fraud | 20_GHQ | Generic - Activity product allocation |
| 4.3.1. Prevent, investigate & detect COB-related customer fraud | 20_SEG | Treated volumes * handling time |

| | | |
|---|---|---|
| 4.3.1. Prevent, investigate & detect COB-related customer fraud | 39_CBU | COB alarms |
| 4.3.2. Manage COB-related payments | 20_GHQ | Generic - Activity product allocation |
| 4.3.2. Manage COB-related payments | 39_CBU | Billing cycle |
| 4.3.3. Manage COB-related debit collection | 20_GHQ | Generic - Activity product allocation |
| 4.3.3. Manage COB-related debit collection | 39_CBU | Revenue by product of CBU/EBU unpaid invoices (invoices with due date 2009 and customer status: DCO, CRT, DFR, BAN, DNO, DON, REC) |
| 4.3.3. Manage COB-related debit collection | 40_CWS | Billed revenues per system |
| 4.3.3. Manage COB-related debit collection | 41_EBU | Revenue by product of EBU unpaid invoices (invoices with due date 2009 and customer status: DCO, CRT, DFR, BAN, DNO, DON, REC) |
| 4.4.1. Manage SAP A/R related manual bills / credit notes | 20_FIN | Number of manual invoices/credit notes |
| 4.4.1. Manage SAP A/R related manual bills / credit notes | 20_GHQ | Generic - Activity product allocation |
| 4.4.1. Manage SAP A/R related manual bills / credit notes | 20_SEG | Number of manual invoices/credit notes |
| 4.4.1. Manage SAP A/R related manual bills / credit notes | 39_CBU | Number of manual invoices/credit notes |
| 4.4.1. Manage SAP A/R related manual bills / credit notes | 40_CWS | Billed revenues per system |
| 4.4.1. Manage SAP A/R related manual bills / credit notes | 41_EBU | Number of manual invoices/credit notes |
| 4.5.1. Manage IBIS-related national inter-carrier billing problem handling, production & collection | 20_GHQ | Generic - Activity product allocation |
| 4.5.1. Manage IBIS-related national inter-carrier billing problem handling, production & collection | 40_CWS | Billed revenues per system |
| 4.5.1. Manage IBIS-related national inter-carrier billing problem handling, production & collection | 78_IFM | Billed revenues per system |

For staff & support divisions, costs are often allocated depending on the costs already charged to the products, independently of the subprocess.

For SDE & customer divisions (CBU, EBU & CWS), costs are mainly allocated as follows :

- directly to one product,
- based on billing BCI cases,
- based on billing cycle,
- based on revenues per product,

- based on the turnover linked to unpaid invoices,
- based on a specific SAP analysis (manual invoices by product),
- based on billed revenue per billing system.

### 4.5.2 Allocation of the management activities.

Four processes cover the management activities:

- HR Management (process 8)
- Financial Management (process 9)
- Administration & General Support (process 10)
- Operational excellence (process 11)

Management activities are mainly allocated to the products according to the cost of products. This is logic since management activities are overhead-type of activities.

#### *4.5.2.1 Process 8: HR Management*

The costs linked to the HR management are mainly allocated to the products according to the total Belgacom S.A. remuneration costs.

In some cases, the keys relate to the remuneration costs of a specific division.

#### *4.5.2.2 Process 9: Financial Management*

For the Finance department, the costs linked to the financial management are mainly allocated to the products according to a blended key based on the revenue for 50% and on the attributed costs for the other 50%.

For the other divisions a total cost key is used (at divisional level or Belgacom-wide).

#### *4.5.2.3 Process 10: Administration & General Support*

The costs linked to the administration & general support activities are mainly allocated to the products on the basis of total costs or remuneration costs of the concerned division or of all divisions when the support is Belgacom-wide.

The PBS (Pension Back Service) amount, which only includes the pension charges related to the active personnel and is in line with the cost accepted by the BIPT in the BRIO, is allocated to all Belgacom products on the basis of remunerations. The same key applies to the collective bonus distributed to the personnel.

The REG activity is subject to an analysis in two steps. A first key is computed based on the time spent by the personnel on regulated reference offers (BRIO, BRUO, BROBA & BROTSOLL) while the remaining time is allocated to the other products based on total costs. Secondary keys are then computed based on volumes to get costs assigned by product.

#### *4.5.2.4 Process 11: Operational excellence*

In this process a total cost key is used (at divisional level or Belgacom-wide).

### 4.5.3 Allocation of the Network/CFO Cable activities

| Activity | Division | Driver |
|---|---|---|
| 5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable) | 20_GHQ | Generic - Activity product allocation |
| 5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable) | 79_BSF | Direct |
| 5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable) | 20_GHQ | Generic - Activity product allocation |
| 5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable) | 79_BSF | Direct |

For staff & support divisions, costs are often allocated depending on the costs already charged to the products, independently of the subprocess.

Process 5 is Network related and all of its activities are performed by SDE. All SDE allocations are described in the Network Stream chapter.

The GHQ and BSF support divisions however also have costs linked to Cable related activities.

Those costs are mainly allocated as follows:

- based on provisioning cable related DUs. This kind of activity cost is, rather than directly to ABC products, firstly sent to network objects and then via EUSs allocated to ABC products (see Network Stream chapter for details),
- Based on repair cable related DUs. This kind of activity cost is, rather than directly to ABC products, firstly sent to network objects and then via EUSs allocated to ABC products (see Network Stream chapter for details).

# 5 Network&IT OPEX de-aggregation

## 5.1 Common OPEX allocation stream IT and Network

In the current organisation, there are no distinct ranges for IT cost centers and Network cost centers. Thus, a same cost center may register IT costs together with non IT costs.

The first goal of the allocation stream is to separate all costs into IT specific costs and Network specific costs.

### 5.1.1 GL61 accounts – Services and Other Goods (SOG)

The GL accounts in the 61 range register outsourced maintenance costs as well as miscellaneous costs driven by staff (GSM, memberships, office material, internal events etc.).

The GL61 accounts were classified in two categories:

- those that may contain some manpower related consumption goods
- those that clearly do not contain manpower related consumption goods

In both cases, an attribution to cost objects is always done at SAP record level. This attribution takes place using different criteria:

- attribution based on GL account denomination (e.g. all records of "612100 - Use GSM" are attributed to the FLAG object "CP_SOGFTE_cc" where cc is the cost center of the SAP record)
- attribution based on SAP details: this is for example the case for GL 611120 – Maintenance infrastructure national contracts; drilling down into SAP records allow to separate IT maintenance and network equipment maintenance.

A variety of destination objects receive costs from GL61 accounts: IT cost objects, Network cost objects and HR driven cost objects.

For the first category of GL61 accounts, the attribution is reported at the level of CostCenter/GL account and for the second category the attribution is reported at GL account level. This is why in this last case, the GL61 costs are grouped in ITN_SOG_POOLS aggregating the cost centers.

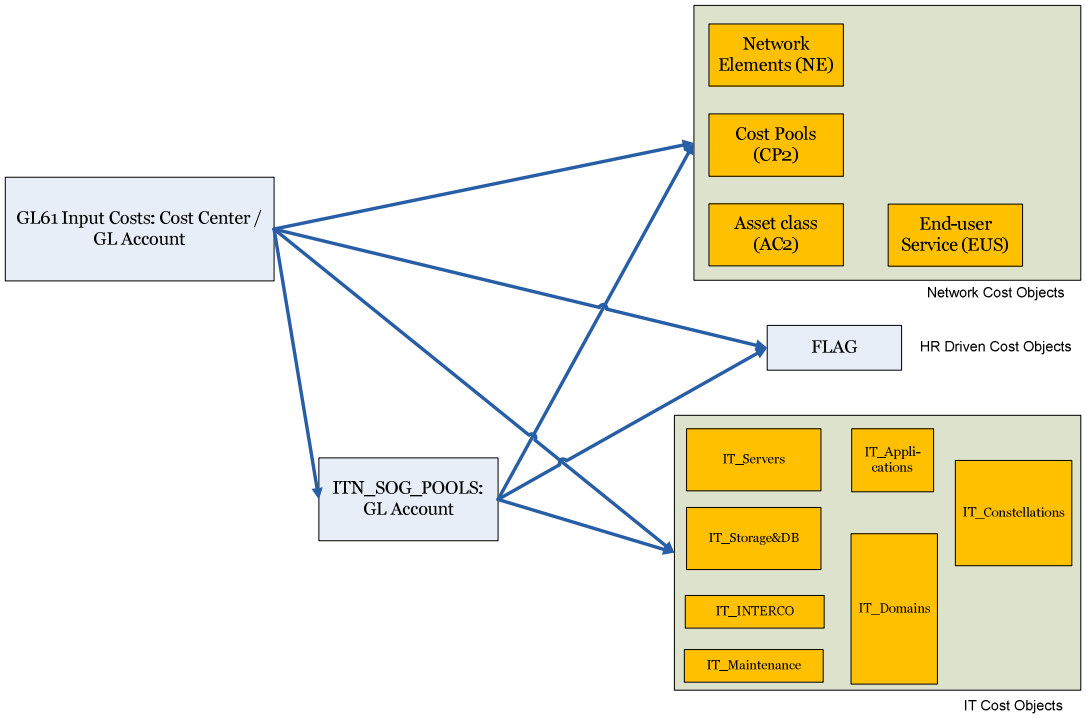



**Figure 7**

### 5.1.2 GL62 accounts – Wages costs

The GL accounts in the 62 range register remuneration costs of salaried staff and manual workers, premiums, social security, bonus etc. Again, these costs are registered per cost center thereby mixing IT staff and non IT staff. The allocation process of OPEX wages cost is processed through a cascade with a particularity on the range of data taken into account for key creation. All costs from the cost base were used to create the keys but the cost base the keys were applied on only take into account SDE minus a few cost centers from COP treated in the ABC model. This was done in order to be coherent with the organizational structure of SDE

**Step 1-**

The allocation stream of wages costs first aggregates the input data into two categories of cost pools (very similar to cost pooling in the ABC model but at the level of cost center):

per level remuneration cost pools:

CostCenter / 6201 - level1

CostCenter / 6202 - level2b

CostCenter / 6203 - level2a

CostCenter / 6204 - level3&4

corrective remuneration cost pools:

CostCenter / 6206 - All levels

CostCenter / 6213 - Correction personnelcost

CostCenter / 6291 - Transfert of TGR cost

CostCenter / 6299 - Total remuneration – dummy

**Step2 –**

The corrective cost pools are allocated to the per level remuneration cost pools:

| **Cost Pool** | **Destination** | allocation driver |
|---|---|---|
| CostCenterX / 6299 Total remuneration - dummy<br>CostCenterX / 6206 All levels | | |
| | CostCenterX / 6201-level1 | remuneration cost |
| | CostCenterX / 6202-level2b | remuneration cost |
| | CostCenterX / 6203-level2a | remuneration cost |
| | CostCenterX / 6204-level3&4 | remuneration cost |
| | | |
| CostCenterX / 6291 transfer of TGR cost | CostCenterX / 6201-level1 | Direct |
| CostCenterX / 6213 Correction personnelcost | CostCenterX / 6201-level1 | Nbr FTE |
| | CostCenterX / 6202-level2b | Nbr FTE |
| | CostCenterX / 6203-level2a | Nbr FTE |
| | CostCenterX / 6204-level3&4 | Nbr FTE |

**Step3 –**

The per level remuneration costs are split over the SDE (new ITN) teamgroups based on the number of FTE of each level in each teamgroup. Indeed, to allow the separation of IT and nonIT remuneration costs, we need to drill down to the level of teams.

32 teamgroups have been defined of as management (overhead) teams (dedicated to management tasks) and 196 executive teams.

Management and executive teams must be separated since the cost drivers are different:

- management team costs are related to the span of control in a structured organisation which is reflected by the number of managed teams and the headcount within these teams
- executive team costs are related to the Network or IT tasks.

The following drawing shows the management hierarchy considered in the model to measure the span of control of the management teams for SDE (for illustration purposes).

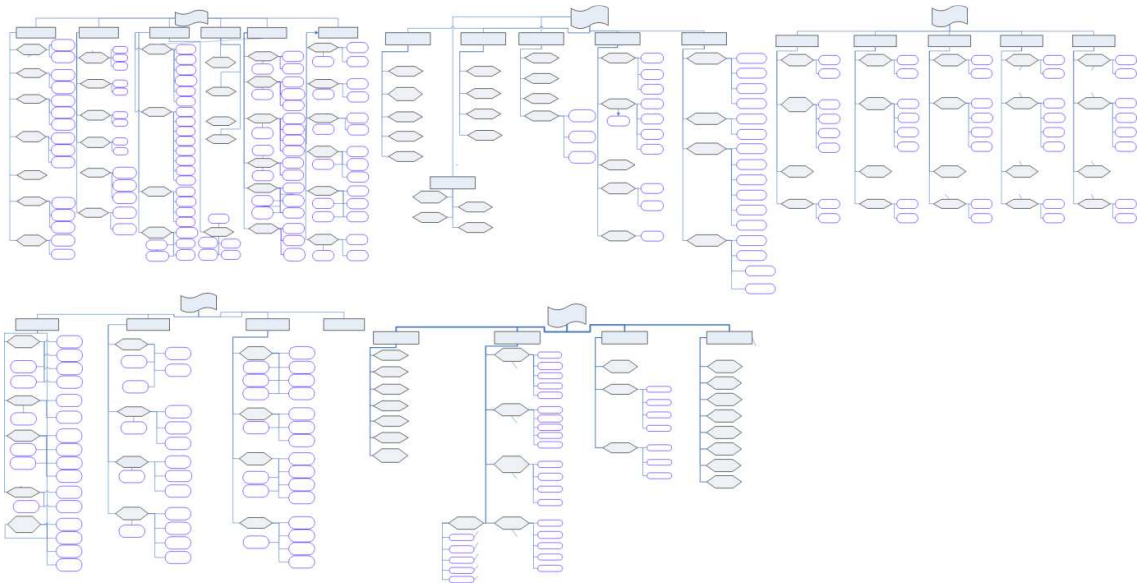


**Figure 8**

**Step4-**

A fourth step is introduced to "cascade" the costs of the overhead teams (management) onto the productive (productive_overhead and productive_executive) teams managed by them. The output objects of these 4 steps are defined in the module "OperationalDriven_HR_CP", each object being an executive teamgroup. At this point in the allocation stream a neat separation can be done between IT related costs (IT teamgroups) and nonIT related costs (nonIT teamgroups).

The four steps of wages allocation are summarized in the following allocation stream:

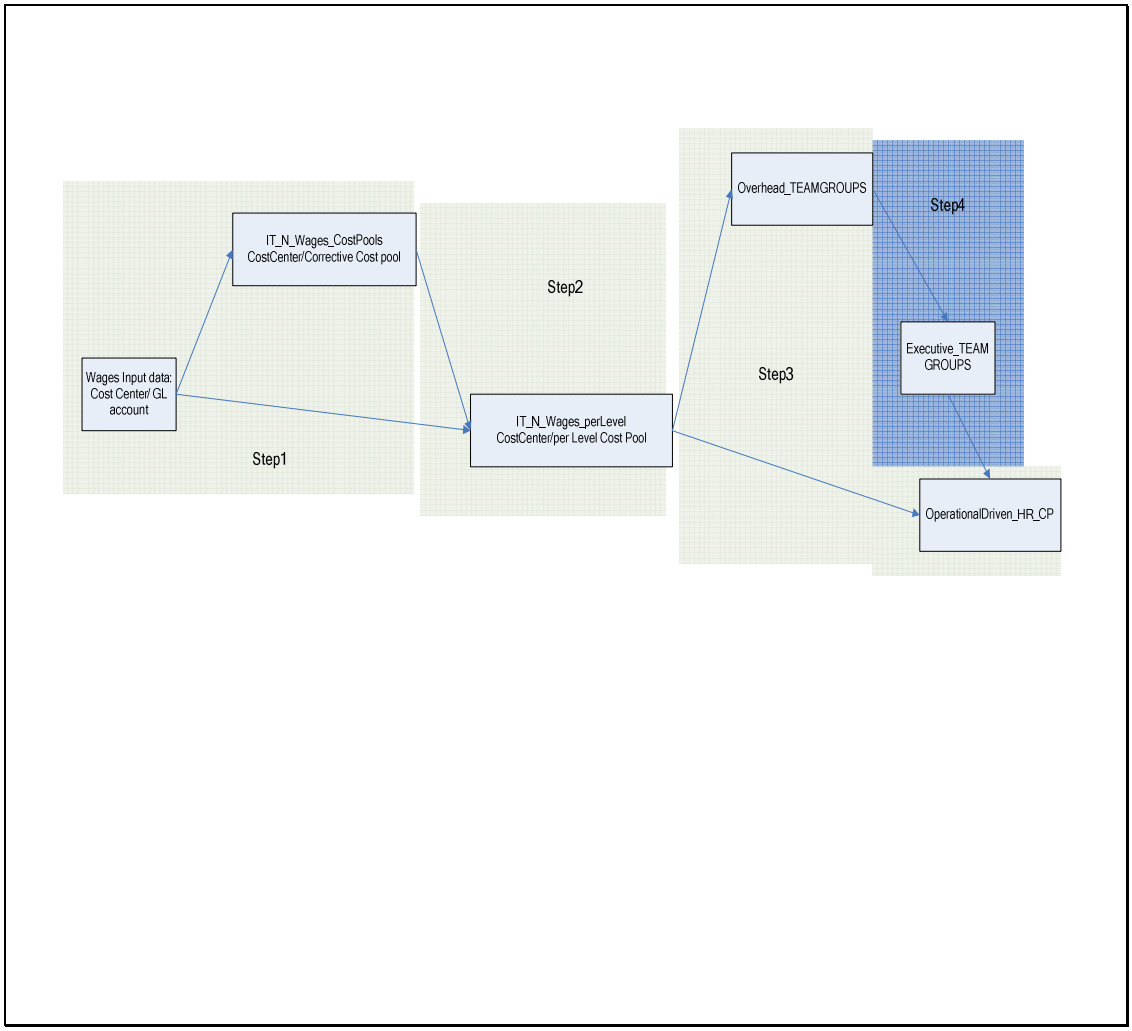



**Figure 9**

### 5.1.3 GL60 accounts – Material Out of Stock

The GL60 account costs cover the cost of all kinds of material taken out of the stocks of Belgacom and used for the repair of network or the cost of small items (office material, GSM,…) consumed by the staff in the context of their daily activities.

Note that movements from stock also occur for the construction of the network; these costs are capitalized. From SAP-MM, it is possible to filter out the movements to be capitalized and the others. The capitalized MOS costs are implicitly treated with the assets.

MOS costs are reported at GL account level per cost center.

This level is too high to allow an accurate attribution of the costs to the model cost objects and therefore an analysis is performed at the SAP-MM record level.

- The SAP records are reported among other detailed information such as the Material Item Number, where the amounts can be directly attributed to a cost object of the cost model based on the description of the material item.

  Around 9000 different Material Items are analysed; each item is directly attributed to a model cost object.

This analysis results in two kinds of model cost objects: network related cost pools (CP1 module objects) and manpower related cost pools (FLAG module objects MOSFTE_per_cc).

Once each material item is attributed to a cost object, it is easy to report an allocation from the CC/GL account aggregate to the model cost objects.

## 5.2 Allocation of teamgroups to NW activities

*1° NW activity categories*

- We distinguish 13 different categories of NW activities in Network Process:
  - Activities linked to NW Infrastructure Engineering
  - Activities linked to NW Product & Service Engineering
  - Activities linked to NW plant works and document
  - Activities linked to NW Inside Installation
  - Activities linked to NW Outside Construction
  - Activities linked to Copper related work
  - Activities linked to VHR, Video and Radio related work
  - Activities linked to NW Infrastructure Remote Configuration
  - Activities linked to NW Service Remote Configuration
  - Activities linked to NW Customer Service Fault Handling & Remote Repair 2nd line
  - Activities linked to NW Service Maintenance & Remote Repair 3rd line
  - Activities linked to NW Infrastructure Maintenance and Remote Repair 3rd line
  - Activities linked to NW Infrastructure Monitoring

- For the purpose of OPEX cost allocation of SDE, the department REG has grouped all SDE teams (NW and IT) into three types of teamgroups:
  - Productive_Executive teamgroup,
  - Productive_Overhead teamgroup,
  - Management teamgroup.

- Productive_Executive teamgroup has been assigned with NW activities for which it's mainly responsible.

- IT related Productive_Executive teamgroups have not been assigned with IT activities. Their OPEX costs are allocated to IT Constellations as described in chapter 6.1.4.2 Operational Costs:.

- One exception is that two teamgroups of SDE IDO have been assigned with the activity 7.1.5. IT Housing Data Center for Customer (IDO-TRS²-DC-INS, IDO-TRS²-DC-OP, IDO-OPE-DC). The cost allocation is described in chapter 6.2 Allocation of IT constellations.

- Productive_Overhead teamgroups provide support to Productive_Executive teamgroups.

- Management teamgroups manage Productive_Overhead teamgroups and Productive_Executive teamgroups.

*2° Allocation of Productive_Executive teamgroups to NW activities*

| Division | Productive_Executive Teamgroup | Driver | Activity |
|---|---|---|---|
| [50_SDE] | COP-CFO1-CAB | Cable provisioning DUs | [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO1-CAB | Cable repair DUs | [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO2-CAB | Cable provisioning DUs | [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO2-CAB | Cable repair DUs | [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO3-CAB | Cable provisioning DUs | [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO3-CAB | Cable repair DUs | [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO4-CAB | Cable provisioning DUs | [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO4-CAB | Cable repair DUs | [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] |
| [50_SDE] | COP-CFO5-CAB | Cable provisioning DUs | [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] |

| | | | |
|---|---|---|---|
| [50_SDE] | COP-CFO5-CAB | Cable repair DUs | [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] |
| [50_SDE] | IDO-FX3-BND-IDE-VHR | Direct | [5.2.9. NW Plan outside plant works, Solution design & Engineering for VHR/Industrial zonings (IDO-FXx-BND-IDE-VHR)] |
| [50_SDE] | IDO-FXx-BND-EQE | # Equivalent FTE | [5.2.1. NW Plan Backbone Inside plant works and document (IDO-FXx-BND-EQE)] |
| [50_SDE] | IDO-FXx-BND-EQE | # Equivalent FTE | [5.2.2. NW Plan Access Inside plant works and document (IDO-FXx-BND-EQE)] |
| [50_SDE] | IDO-FXx-BND-IDE | Direct | [5.2.8. NW Plan outside plant works and document (IDO-FXx-BND-IDE)] |
| [50_SDE] | IDO-FXx-IMR-xxx | # Equivalent FTE | [5.2.3. NW Backbone Inside Installation (HW or SW) (IDO-FXx-IMR-xxx)] |
| [50_SDE] | IDO-FXx-IMR-xxx | # Equivalent FTE | [5.3.1. NW Backbone Inside Maintenance & Repair (IDO-FXx-IMR-xxx)] |
| [50_SDE] | IDO-FXx-IMR-xxx | # Equivalent FTE | [5.3.2. NW Access Inside Maintenance & Repair (IDO-FXx-IMR-xxx)] |
| [50_SDE] | IDO-FXx-LPE-xxx | # Equivalent FTE | [5.2.10. NW (Supervision, coordination and inventory) Outside construction (IDO-FXx-LPE-xxx)] |
| [50_SDE] | IDO-FXx-LPE-xxx | # Equivalent FTE | [5.3.3. NW (Supervision, coordination and inventory) Outside Maintenance & Repair (IDO-FXx-LPE-xxx)] |
| [50_SDE] | IDO-FXx-OPT-OUT | Direct | [5.3.4. NW Access Outside Maintenance & Repair FO, ROP (IDO-FXx-OPT-OUT)] |
| [50_SDE] | IDO-FXx-OPT-Radio | # Equivalent FTE | [5.2.11. NW Access Outside Video event (IDO-FXx-OPT-Radio)] |

| | | | |
|---|---|---|---|
| [50_SDE] | IDO-FXx-OPT-Radio | # Equivalent FTE | [5.3.5. NW Access Outside Maintenance & Repair VHR,Radio (IDO-FXx-OPT-VHR, IFO-FXx-OPT-Radio)] |
| [50_SDE] | IDO-FXx-OPT-VHR | # Equivalent FTE | [5.2.12. NW Access Outside VHR for customer (IDO-FXx-OPT-VHR)] |
| [50_SDE] | IDO-FXx-OPT-VHR | # Equivalent FTE | [5.3.5. NW Access Outside Maintenance & Repair VHR,Radio (IDO-FXx-OPT-VHR, IFO-FXx-OPT-Radio)] |
| [50_SDE] | SDV-NIE-CAT | Direct | [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] |
| [50_SDE] | SDV-NIE-CPE | Direct | [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] |
| [50_SDE] | SDV-NIE-DOT | Direct | [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] |
| [50_SDE] | SDV-NIE-LAB | Direct | [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] |
| [50_SDE] | SDV-NIE-PLE | Direct | [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] |
| [50_SDE] | SDV-PSE-DAC | Direct | [5.1.2. NW Product & Service Engineering (SDV-PSE-xxx)] |
| [50_SDE] | SDV-PSE-VID | Direct | [5.1.2. NW Product & Service Engineering (SDV-PSE-xxx)] |
| [50_SDE] | SDV-PSE-VNC | Direct | [5.1.2. NW Product & Service Engineering (SDV-PSE-xxx)] |
| [50_SDE] | SIO-CSC-NOC_NW | Direct | [5.3.11. NW Infrastructure Monitoring (SIO-CSC-NOC excl. ITMON)] |
| [50_SDE] | SIO-CSC-SSD | Direct | [5.3.7. NW Customer Service Fault Handling & Remote Repair 2nd line (SIO-CSC-SSD)] |
| [50_SDE] | SIO-INO-DSP | # Equivalent FTE | [5.2.7. NW Data&TV&CDR Service Remote Configuration (SIO-INO-DSP)] |
| [50_SDE] | SIO-INO-DSP | # Equivalent FTE | [5.3.9. NW Data&TV&CDR service level Maintenance & Remote Repair 3rd line (SIO-INO-DSP)] |

| | | | |
|---|---|---|---|
| [50_SDE] | SIO-INO-TIO | # Equivalent FTE | [5.2.5. NW Infrastructure Remote Configuration (SIO-INO-TIO)] |
| [50_SDE] | SIO-INO-TIO | # Equivalent FTE | [5.3.10. NW Infrastructure Maintenance and Remote Repair 3rd line (SIO-INO-TIO)] |
| [50_SDE] | SIO-INO-VSP | # Equivalent FTE | [5.2.6. NW Voice Service Remote Configuration (SIO-INO-VSP)] |
| [50_SDE] | SIO-INO-VSP | # Equivalent FTE | [5.3.8. NW Voice service level Maintenance & Remote Repair 3rd line (SIO-INO-VSP)] |

Productive_Executive teamgroups are mainly allocated to NW activities as follows:

- direct allocation, if a teamgroup has been assigned with only one activity. This is the major case for SDE SDV teamgroups.
- on the basis of the work hours performed, if a teamgroup having been assigned with more than one activity. The reporting systems used are CLARA for SDE COP CFO CAB teamgroup, ABB for SDE SIO teamgroups and LEAD, JMS and CANVAS for SDE IDO teamgroups. Those work hours have been translated into the different driver quantities by taking into account standard time per activity:
  - DUs as driver quantity for SDE COP CABLE teamgroups.
  - Mandays as driver quantity for SDE SDV teamgroups for network engineering activity and product engineering activity.
  - Equivalent FTEs as driver quantity for SDE IDO teamgroups for network field construction activities and network field repair activities.
  - Equivalent FTEs as driver quantity for SDE SIO teamgroups for network remote configuration activities and network remote repair&maintenance activities.

# 6 IT stream

## 6.1 IT delivery

### 6.1.1 IT Sub-Model: Introduction to the Allocation :

The IT costs are those incurred by the company for the use of programs with a specific infrastructure to deliver a requested service or product to the end-user (which can be a Belgacom Client or a Belgacom Employee). In Telecommunications, rarely will we encounter an Application that is exclusively being used by one product. Most of the time, one application will be used by many different products. Therefore, the goal of this model is to regroup all capitalized and operational costs within clusters of applications that have been defined so that the link to products can easily be made.

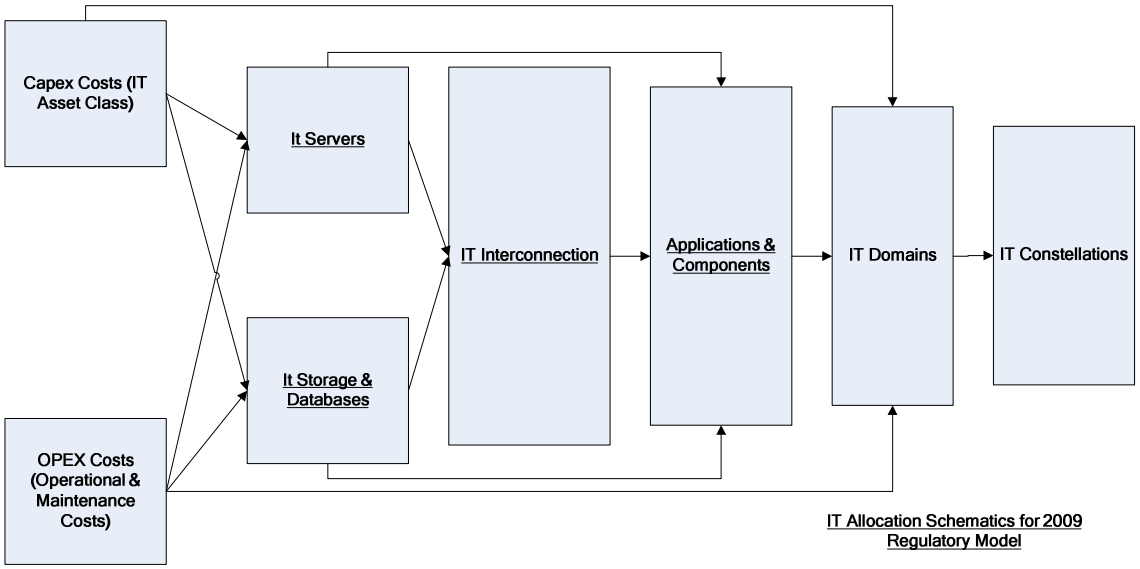



**Figure 10**

Reporting systems and inventories either report to an application and its component or to an IT Domain. Among more than a thousand applications, IT engineering defined 282 Domains for reporting purposes and their definition were adapted into the IT Sub-Model in order to give coherence over the years, since both naming convention and reporting systems changed frequently. Both of these Applications and Domains are then pooled into an aggregate serving the same purposes which are called IT Constellations. The allocation stream goal is to link applications, components and domains to the manpower and infrastructure costs that are used in order to create and run and maintain them.

These costs can be of two different types: capitalized and therefore depreciated following accounting rules (for IT, depreciation length is mostly 4 or 5 years), or operational and fully charged for the current year. Depending of the cost's nature, the allocation stream will follow a different path and use different inventories and reporting systems in order to create the optimal allocation keys.

### 6.1.2 Data sources: IT Inventories and Reporting Systems:

#### *6.1.2.1 Infrastructure and Hardware Inventory:*

The hardware layer of the IT Infrastructure within Belgacom is composed of a server park, a storage facility and an intranet required to interconnect them. For Servers allocation, three inventories were used to populate the park and gain depth in their use. Regarding Storage, the reporting system can extract all directories paths names on Belgacom's hard-drives with the storage space it uses.

#### *6.1.2.2 Internal IT Databases:*

A number of databases are available and have been used as reporting on applications , databases, computing platforms , their relationships and their usage :

- Configuration management database
- IT Asset management
- Business modeling database
- Identifier management system for IT applications

#### *6.1.2.3 Reporting Systems:*

A specific tool (RAPID) is available to report on projects, budget and capacity management related processes, with interfaces to other core systems such as SAP HR (human resource & organization units data) , SAP Finance (actual, purchase order..), IMD (release Management) and timesheets applications (used by SDE to report their day-to-day work). The tool is used to calculate allocation keys for most manpower costs for SDE, Capex and Opex.

Regarding maintenance and contractors, a repository is maintained within SDE with all financial details (actuals, general ledger account n°, cost center…) as well as vendors details (name of the product vendor and the subcontractor, contract name…).

## 6.1.3 Modules and Objects composing the IT Sub-Model

### *6.1.3.1 IT Servers*

A server is a computer running as a service to serve the needs or requests of others programs or users. They are bought off several vendors which use different technology types. These machines are upgraded on a frequent basis in terms of memory, cpu cache and quantity or i/o cards. This results in a heterogeneous park of servers, even for a similar model sold by the same vendor, having a negative effect in terms of cost variance. Therefore , the servers have been split in different families based on their technology. Splitting the server asset between these families was possible by the use of a specific reporting that is done yearly by Finance.

### *6.1.3.2 Storage*

In the storage tool, reported directories paths have been assigned the name of an application or a database in their path. It allows us to know precisely the amount of storage used by each application, database or another object in the sub-model.

### *6.1.3.3 IT Interconnection*

**a) Connect IT:**

Connect IT is the Intranet used by the IT infrastructure in order to inter-connect the different objects it uses to deliver a service. The allocation will be based on a post-process generic key defined by the CAPEX cost of servers. Since there is a direct correlation between a server's cost and the data it sends and receives (through its i/o card which is one of the main contributors to a server's cost).

**b) Application Interaction Platform:**

The Application Interaction Platform object is defined as the software layer required to interconnect Belgacom's complex IT infrastructure.

**c) IT Overhead**

The overhead object is a pool of costs that manages the Belgacom's IT Infrastructure.

## 6.1.4 Allocation Process for IT Assets and Operational Costs:

### *6.1.4.1 IT Assets*

There are two types of IT assets : Hardware and software assets.

#### 6.1.4.1.1 Hardware asset classes :

Within the hardware assets , the most important ones collect the investments in servers, storage, Office automation , IT network .

**Server assets** are used by applications (software sold by a vendor or developed in-house) and by databases or for even interconnectivity and security. These assets pool most of servers families used within the company.

The costs of these assets are allocated into families of servers based on purchasing information allowing to attribute a weight to each server, and based on an inventory of servers per family.

**Storage assets** collect investments required in order to run applications and databases, create backup and archives to save an employee's work or customer's information (regarding billing or call details records for instance).

**IT Internal Network assets** aggregate the investments pertaining to the internal IT network required to support the needs of employees as well as the interconnection needed in order for the different IT objects to communicate. These costs are integrally allocated to the Connect-IT object.

**Office Automation assets** aggregate investments to improve productivity such as laptops, desktops, development environment, mails exchange platform, printing servers etc. These costs are directly sent to the IT_OfficeAutomation constellation.

**Datacenters** assets IT costs are pooled in this Asset. The number of physical servers running in those datacenters for each IT object was used as an allocation key to ventilate these costs.

#### 6.1.4.1.2 Software asset classes :

There are currently about 30 different asset classes for applicative software. Each class is the collection of internal well identified applications; the cost of each class is allocated towards one or several IT constellations either directly (100%) when the collection of underlying applications fits completely in a IT constellation, or using a driver that is the number of capitalized development FTEs per underlying application during the last 5 years (depreciation period). These FTE effort values are gathered from historical data in the financial reporting system, and allow to relate development FTE precisely to an application.

### *6.1.4.2 Operational Costs:*

IT maintenance is one of the main contributors of operational costs. All other costs are the ones that are not maintenance related nor capitalized in the previous assets. The methodology followed is different from the one used to allocate capitalized costs as explained previously.

Operational costs are extracted from SAP by Finance and are reported by cost centers. As they may regroup employees working on different tasks, as well as using a structure that may not be close to

reality in all cases following the integration of Belgacom's subsidiaries, a functional approach was adopted in order to match the field's reality of the SDE division. This introduces the concept of Functional Domains, an acronym created for each level 3 team, which is generally a deep enough level to know precisely what is done by these teams. The mapping between cost centers and functional domains was done by Finance, as it used to report mandays to the system in a functional way. It was adapted by the Regulatory team in order to give more consistency to the data in aggregating some functional domains, or splitting them further more when needed (for instance: the monitoring department is shared by the IT monitoring team and the network monitoring team). RAPID reports mandays per functional domain and cost center with details regarding which IT or Network objects are impacted. All Opex mandays from Belgacom employees reported in RAPID for 2009 will be used as keys to distribute costs per IT domain. The first step is to split the functional domains by type: they can be IT or Network related. There are 25 functional domains reporting costs in the IT sub-model.

Maintenance Costs is the other source of operational costs. A report provided by the department managing maintenance contract was used to map all costs to an IT object in the model. Maintenance can be related to server's maintenance as well as application's.

### 6.1.5 Applications to Constellations

#### a) IT Applications

The IT applicative layer is composed of applications or software being used by either an end-user (such as an employee or a customer) or by a service (such as an inventory or a billing system). There are more than 1000 applications that have been bought off a vendor and adapted to suit the company's needs or developed internally by Belgacom's IT developers. Over the years, these applications have been updated, replaced, renamed or outphased. Applications and their dependencies are reported in the IT configuration inventory with their acronym, their fullname and their description, allowing us to link them to constellations.

#### b) IT Domains

IT Domains are created by IT engineering and is a helpful means to both report IT manhours and to regroup IT applications into functional blocks. In terms of reporting, RAPID assigns reported hours to an IT domain instead of an application. This stage is therefore essential to the allocation of OPEX IT manhours.

#### c) IT Constellations

IT Constellations are the ultimate IT objects of the IT sub-model: it is the bridge between the sub-model and the products. The following constellations were created in order to group all IT costs in an end-object.

For each of them, a specific allocation key is used in order to allocate costs to products. Further details regarding the allocation of constellations can be found in part 6.2

## 6.2 Allocation of IT constellations

| IT_CONSTELLATION | Driver |
|---|---|
| 7.1.1. End user support for BGC SA employees (IT) | Generic key: total wages cost |
| 7.1.3. End user support for external customers (IT) | direct |
| 7.1.5. IT Housing Data Center for Customer (IDO-TRS²-DC-INS, IDO-TRS²-DC-OP, IDO-OPE-DC) | revenue |
| 7.2.1. Manage implementation and support of new or modified IT applications(20_FIN) | direct |
| 7.2.1. Manage implementation and support of new or modified IT applications(20_GHQ) | direct |
| 7.2.1. Manage implementation and support of new or modified IT applications(40_CWS) | direct |
| 7.2.1. Manage implementation and support of new or modified IT applications(79_BSF) | direct |
| IT_BelgacomMobile | direct |
| IT_BICS | direct |
| IT_Billing | Generic key: Process 4 costs on ABC_PRODUCTS except activity 4.5.1. Manage IBIS-related national inter-carrier billing problem handling, production & collection |
| IT_Billing_Voice_Retail&Wholesale | number of call (internal, external, freephone all included) |
| IT_Billing_Wholesale | Generic key: cost on ABC_PRODUCTS of activity 4.5.1. Manage IBIS-related national inter-carrier billing problem handling, production & collection |
| IT_Business_Intelligence | Generic key: cost of all ABC products |
| IT_CRM | number of subscription (external only) |
| IT_ERP | 1/3 to BA&activity "9.1.1. Provide financial services"; 1/3 to BA&activity "8.1.1. Provide HR services"; 1/3 to BA&each activity of (subprocess) 6.1. Supply Chain Management |
| IT_ERP_BI | Generic key: cost of all ABC products |

| | |
|---|---|
| IT_ERP_Common | 1/3 to BA&activity "9.1.1. Provide financial services"; 1/3 to BA&activity "8.1.1. Provide HR services"; 1/3 to BA&each activity of (subprocess) 6.1. Supply Chain Management |
| IT_ERP_CRM | number of subscription (external only) |
| IT_ERP_FIN | to BA&activity "9.1.1. Provide financial services" |
| IT_ERP_HR | to BA&activity "8.1.1. Provide HR services" |
| IT_ERP_LOG | to BA&each activity of (subprocess) 6.1. Supply Chain Management |
| IT_EUC | Generic key: total wages cost |
| IT_fulfillment_BRIO_CPS&NumberPortability | request volume |
| IT_fulfillment_BRIO_CPS | direct |
| IT_Fulfillment_Explore | provisioning volume |
| IT_Fulfillment_LeasedLines | EUS_LL provisioning volume |
| IT_Fulfillment_NumberPortability | 50% to "21202 Nat. Number portability Access per line"; 50% to "11131 Traff. Outg.MOLO" |
| IT_Fulfillment_PIA | provisioning volume (number of connection) |
| IT_Fulfillment_PILA | (de)provisioning volume |
| IT_Fulfillment_PILA_Retail | provisioning volume (number of connection) |
| IT_Fulfillment_Transport | provisioning volume |
| IT_Garbage | direct |
| IT_IDTV | direct |
| IT_Inventory_CableInfrastructure | to activity "5.2.8. NW Plan outside plant works and document (IDO-FXx-BND-IDE)" |
| IT_Inventory_Data | 25% to "CP_DSLAM"; 25% to "CP_ATM_Equipment"; 25% to "CP_IPVPN_equipment"; 25% to "CP_EthernetMPLS_equipment" |
| IT_Inventory_DIM | revenue |
| IT_Inventory_Ethane | direct |
| IT_Inventory_LocalLoop&Transmission | Generic key: CAPEX of following NEs (GROUP_TECHNOLOGY=(D)WDM,SDH,Ethernet,PDH,MWE,CopperPlant) |
| IT_Inventory_LocalLoop | direct |
| IT_inventory_PSTN/ISDN | direct |
| IT_Inventory_Transmission | Generic key: CAPEX of following NEs (GROUP_TECHNOLOGY=(D)WDM,SDH,Ethernet,PDH,MWE) |
| IT_Inventory_Voice | direct |

| | |
|---|---|
| IT_JMS | 90% to activity "5.2.10. NW (Supervision, coordination and inventory) Outside construction (IDO-FXx-LPE-xxx)"; 10% to activity "5.3.3. NW (Supervision, coordination and inventory) Outside Maintenance & Repair (IDO-FXx-LPE-xxx)" |
| IT_MediationDevice_DSLAM | direct |
| IT_Office_Automation | Generic key: total wages cost |
| IT_Payphone | direct |
| IT_Security | Generic key: total wages cost |
| IT_ServiceAssurance | subscription (internal and external) volume |
| IT_ServiceAssurance_Data&Transmission | Generic key: CAPEX of following NEs (GROUP_TECHNOLOGY=(D)WDM,SDH,Ethernet,PDH,MWE,CopperPlant) |
| IT_ServiceAssurance_Explore | site (subscription) volume |
| IT_ServiceAssurance_Internet | direct |
| IT_ServiceAssurance_LeasedLines | subscription (EUS_LL) volume |
| IT_ServiceAssurance_PIA | subscription (internal and external) volume |
| IT_ServiceAssurance_PIA_Retail | subscription (internal and external) volume |
| IT_ServiceAssurance_PILA | subscription (internal and external) volume |
| IT_ServiceAssurance_Transport&Wholesale | subscription (internal and external) volume |
| IT_ServiceAssurance_Voice | direct |
| IT_SKYNET | direct |
| IT_Skynet_Billing | direct |
| IT_Telindus | direct |
| IT_WFM | DU volume |

We distinguish mainly 12 different categories of IT Constellations:

- IT Constellation directly linked to IT Process
- IT Constellation providing support to Subsidiaries
- IT Constellations providing support to Customer Relationship Management (CRM)
- IT Constellations providing support to Business Intelligence analysis work
- IT Constellations providing support to Fulfillment Process
- IT Constellations providing support to Assurance Process
- IT Constellations providing support to Billing Process
- IT Constellations providing support to ERP (Enterprise Resource Planning)
- IT Constellations providing support to internal IT usage
- IT Constellations providing support to Network Inventory
- IT Constellations providing support to Work Force Management (WFM)

- IT Constellation providing support to a specific ABC product

*1° IT Constellation directly linked to IT Process*

The costs are mainly allocated as follows:

- directly to one Management activity,
- directly to one product,
- based on product revenue.

*2° IT Constellation providing support to Subsidiaries*

The costs are mainly allocated as follows:

- directly to "30000 Subsidiaries & externals" product.

*3° IT Constellations providing support to Customer Relationship Management (CRM)*

The costs are mainly allocated as follows:

- sent to product based on product external subscription volume.

*4° IT Constellations providing support to Business Intelligence analysis work*

The costs are mainly allocated as follows:

- sent to product based on product OPEX cost (except COGS).

*5° IT Constellations providing support to Fulfillment Process*

The costs are mainly allocated as follows:

- sent to product based on product provisioning volume.

*6° IT Constellations providing support to Assurance Process*

The costs are mainly allocated as follows:

- sent to product based on product external/internal subscription volume.

*7° IT Constellations providing support to Billing Process*

The costs are mainly allocated as follows:

- sent to product based on cost of billing related activities cost,
- sent to product based on product traffic volume.

*8° IT Constellations providing support to ERP (Enterprise Resource Planning)*

The costs are mainly allocated as follows:

- sent, in average, to relevant Management and Support activities.

*9° IT Constellations providing support to internal IT usage*

The costs are mainly allocated as follows:

- sent to product based on product WAGES cost.

*10° IT Constellations providing support to Network Inventory*

The costs are mainly allocated as follows:

- directly sent to one network object,
- sent to, in average, relevant network objects,
- sent to network object based on network object CAPEX cost,
- sent to, based on defined %, Network activities,
- sent to product based on product revenue.

*11° IT Constellations providing support to Work Force Management (WFM)*

The costs are mainly allocated as follows:

- sent to product based on executed provisioning and repair DUs for product.

*12° IT Constellation providing support to a specific ABC product*

The costs are mainly allocated as follows:

- directly sent to specific product.

Cost of all IT Constellations are allocated to either ABC Products, Business Primary activities, Management Activities, Support Activities, NW Primary activities or NW objects. All these are processed in "IT_Constellations & Process 7" box (ref to Figure 2: Graphic representation of the Belgacom Regulatory Cost Model 2009) and ending in cost objects of different modules.

# 7 Network stream

The network allocation stream is organized around the network investment structure (leading to network functional blocks in the allocation stream) as opposed to the ABC allocation flow which is organised around the business and support activities (Activity based costing). For the network stream the focus is on Capital Expenditure costs which are directly associated with the network equipment deployed ; these costs originate from the assets accounting system of Belgacom and they are gradually cascaded by means of a variety of cost deaggregation keys and a variety of cost drivers up to the telecommunication services. By contrast, the ABC stream focuses on the operating expenditures of the business activities, which are directly allocated to end-products by means of business drivers. The allocation cascade of the network building blocks is presented in section 7.1.

For the operating costs of the network itself however, an intermediate allocation approach is used : the remuneration costs and the personnel related OPEX costs are associated to typical network activities (as described in section 5.1 and in section 5.2 ) which are finally attributed to network functional blocks . This part is discussed in section 7.10 hereafter .

## 7.1 A layered allocation model

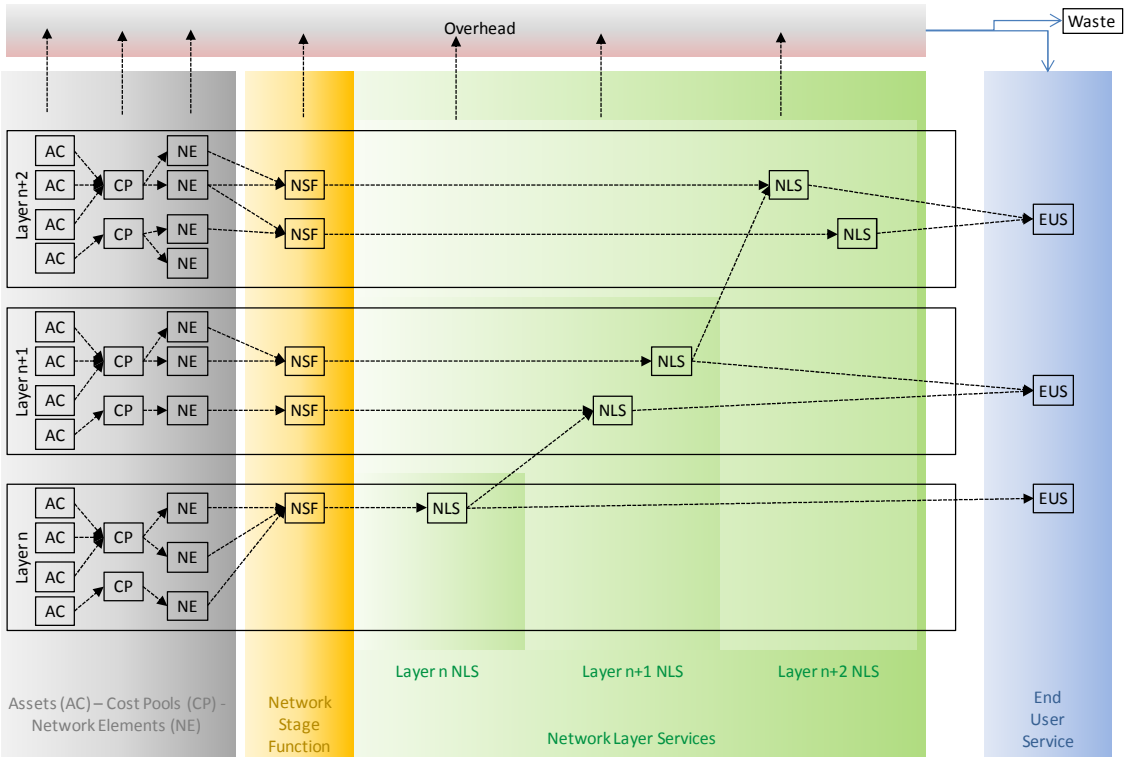



**Figure 11 - Layered allocation model**

It is common practice in the telecommunication industry to separate investments in different logical levels , lower levels corresponding to basic (simple and general purpose) services, higher levels corresponding to complex higher valued and purpose oriented services. The pursued effect of such separation is to promote the reuse of basic lower level services by higher level services thereby bringing in the short term the volumes at each layer to levels that benefit from economies of scale. In the long term, the pursued effect is to benefit also from economies of scope.

The network cost allocation model is designed to reflect the layered functional structure of Belgacom's telecommunication infrastructure , each layer offering services to the upper layers. In practice , 6 layer levels are represented in the cost allocation model in order to allow each invested technology to be situated at the right level of its contribution in implementing the layer services.

In practice , a network equipment may participate to several different layers especially in the interfacing boards towards other network equipment because it acts as a terminating point of lower level layer services; for example an IP router interface typically implements ATM specification (for the ATM Virtual Circuits terminating in the equipment) as well as SDH specification (for the termination of Virtual Containers transporting ATM Virtual Circuits).

To avoid any ambiguity , a network equipment will be considered as belonging to the highest layer implemented in it and operated by it . For the example of the IP router , this simple criterium locates an IP router on the third layer (IP layer) above ATM and SDH.

Using this criterium all investments still in service of Belgacom's infrastructure are distributed in one of the following layers:

Layer NLS1.0 : Passive infrastructure gathering investments in access copper, in ducts and fibre cables (access and backbone).

Layer NLS1.1 : Active optical networking infrastructure gathering investments in WDM , DWDM technology.

Layer NLS2.0 : Active transmission infrastructure based on Time Division Multiplexing technology gathering investments in PDH, SDH.

Layer NLS2.1 : Active data infrastructure based on Packet Based technology gathering investments in ATM, Ethernet/MPLS.

Layer NLS3 : Active data infrastructure based on IP technology gathering IP routers , IPVPN routers.

Layer NLS4.0 : Active application infrastructure based on a variety of technologies gathering applicative equipment like telephony digital switches, VoIP platforms, Intelligent Network platforms, Broadcast TV platforms, Video on Demand platforms.

In the model (see Figure 11 - Layered allocation model) , layers are represented by a number of "standard" services (referred to in the sequel as Network Layer Services – NLS) offered to upper layers or directly used as retail/wholesale products (End User Services – EUS) . In turn the services offered by a layer are the result of the combination of layer specific functions (referred to as Network Stage functions – NSF) and services offered by lower level layers allowing the layer specific functions to interact with each other.

*Layer n--layer n+1 cost allocation mechanism:*

Each layer represented in the model produces the defined NLS services with a certain amount of volume (the service amount); this amount is "consumed" by the upper layer services and it is used as a driver to allocate the costs to the consumer services in the upper layers.

*Layer cost allocation cascade:*

The 6 defined layers are put one after another according to their level generating a cascade of cost allocation mechanism (see Figure 11 - Layered allocation model).

Each layer is discussed in a specific chapter of this documentation.

*Establishing costs of the Network Stage Functions*

The "network stage functions" (NSF) are the direct constituents of a layer ,they are intermediate network building blocks providing well defined logical network functions specific to that layer (also called network functional units) . A Network Stage Function can be limited to a node or it can be a cluster (distributed function) corresponding to "network stages" : access stage (functional cluster including all customer sites and the central offices), backbone regional stage , backbone core stage, backbone express stage . A network stage function is characterized by the amount of function it produces (volume).

Network Stage Functions are implemented in equipment , but the corresponding investment values are not always directly identifiable in the asset structure of Belgacom : for example some assets aggregate investments per technology (not per function in the network) , some other do not cover the totality of a given technology due to the history of the accounting asset structure in SAP (reorganization of assets, transfers between assets, closing of asset classes and opening of new ones) .

Different methods are used and combined to constitute the investment costs of Network Stage Functions :

1. Aggregation of assets in a larger asset or a cost pool in order to gather investments of same technology and align them with operational inventories.
2. Deaggregation of cost pools in network elements : this step decomposes cost pools into network elements; a network element corresponds to an entire physical equipment as deployed in the Belgacom infrastructure. Operational inventories of pieces of equipment and component prices are used.
3. Direct allocation of assets or cost pools to network elements when the assets or cost pools are directly identifiable with a network element of the model.
4. Composition of the network elements to form a network stage function covering one of the stages.

The stepwise combination of these methods are discussed in the next section.

## 7.2 From Assets to Network Stage Functions.

Next table gives the list of the 84 NSF present in the network allocation flow.

| Layer | Layer Name | NSF_Name | NSF short description |
|---|---|---|---|
| Layer | L1_PASSIV | NSF_Access_to_Backbone_fibre | physical access in central site to the backbone fibre |

| | | | |
|---|---|---|---|
| 1.0 | E | | |
| Layer | L1_PASSIV | NSF_Access_to_copper_pairs_inTechnical | physical access in central site to the copper pairs of outside |
| 1.0 | E | Building | copper plant |
| Layer | L1_PASSIV | NSF_Access_to_distribution_pairs_inStree | physical access in street site to the copper pairs towards |
| 1.0 | E | t | customers |
| Layer | L1_PASSIV | | physical access in street site to the copper pairs towards |
| 1.0 | E | NSF_Access_to_feeding_pairs_inStreet | central site |
| Layer | L1_PASSIV | | |
| 1.0 | E | NSF_Split_Copper_Signal | split narrowband and broadband signals in a copper pair |
| Layer | L1_PASSIV | | |
| 1.0 | E | NSF_Access_to_FTTC_fibre_inStreet | physical access in street site to fibre towards central site |
| Layer | L1_PASSIV | NSF_Access_to_FTTx_fibre_inTechnicalBui | physical access in central site to fibre towards remote site |
| 1.0 | E | lding | (customer or curb) |
| Layer | L1_PASSIV | | |
| 1.0 | E | NSF_Backbone_Duct&Manholes | burried ducts of backbone |
| Layer | L1_PASSIV | | |
| 1.0 | E | NSF_Backbone_Fibre_bundle | backbone fibre |
| Layer | L1_PASSIV | | twisted copper pair connectivity between street cabinet |
| 1.0 | E | NSF_Copper_Distribution_pairs | and customer copper premise |
| Layer | L1_PASSIV | | twisted copper pair connectivity between street cabinet |
| 1.0 | E | NSF_Copper_Feeding_pairs | and central site |
| Layer | L1_PASSIV | | fibre bundle connectivity between central office and street |
| 1.0 | E | NSF_FTTC_bundle(4or8fibres) | level site |
| Layer | L1_PASSIV | | underground hole between central office and street level |
| 1.0 | E | NSF_FTTC_Duct&Manholes | site |
| Layer | L1_PASSIV | | fibre bundle connectivity between central office and customer site or intermediate complex node (in access |
| 1.0 | E | NSF_FTTO_bundle | network) |
| Layer | L1_PASSIV | | underground hole between central office and customer or |
| 1.0 | E | NSF_FTTO_Duct&Manholes | intermediate complex node (in access network) |
| Layer | L1_PASSIV | NSF_Intercept_Distribution_pairs_inStree | derivation back and forth of customer twisted pair from |
| 1.0 | E | t | street cabinet towards street optical platform |
| Layer | L1_PASSIV | NSF_Intercept_Feeding_pairs_inTechnical | derivation back and forth of customer twisted pair from central site distribution towards central site broadband |
| 1.0 | E | Building | equipment |
| Layer | L1_PASSIV | NSF_Continue_Feeding_pairs_inTechnical | extension inside central site of twisted pairs towards other |
| 1.0 | E | Building | access equipment |
| Layer | L1_ACTIVE | | put or retrieve a digital signal from a optical wavelength in |
| 1.1 | _ANALOG | NSF_Access_Add_Drop_Lambda | the access network |
| Layer | L1_ACTIVE | | put or retrieve a digital signal from a optical wavelength in |
| 1.1 | _ANALOG | NSF_Core_Add_Drop_lambda | the core backbone network |
| Layer | L1_ACTIVE | | multiplex/demultiplex optical wavelengths, amplify |
| 1.1 | _ANALOG | NSF_Core_Optical_Networking | composed optical signal in the core backbone network |
| Layer | L1_ACTIVE | | put or retrieve a digital signal from a optical wavelength in |
| 1.1 | _ANALOG | NSF_Express_Add_Drop_lambda | the backbone express network |
| Layer | L1_ACTIVE | | multiplex/demultiplex optical wavelengths, amplify |
| 1.1 | _ANALOG | NSF_Express_Optical_Networking | composed optical signal in the express backbone network |
| Layer | L1_ACTIVE | | put or retrieve a digital signal from a optical wavelength in |
| 1.1 | _ANALOG | NSF_Regional_Add_Drop_lambda | the backbone regional network |
| Layer | L1_ACTIVE | | multiplex/demultiplex optical wavelengths, amplify |
| 1.1 | _ANALOG | NSF_Regional_Optical_Networking | composed optical signal in the backbone regional network |
| Layer2.0 | L2_TDM | NSF_PDH_DigitalCrossConnect | sub 2M digital cross connect |
| Layer2.0 | L2_TDM | NSF_SDH_Core_Ring | SDH backbone core clusters |
| Layer2.0 | L2_TDM | NSF_SDH_DigitalCrossConnect | |
| Layer2.0 | L2_TDM | NSF_SDH_Express_Ring | SDH backbone express clusters |
| Layer2.0 | L2_TDM | NSF_SDH_Grooming | collection of SDH bandwidths from access network and distribution to backbone network |
| Layer2.0 | L2_TDM | NSF_SDH_Point_to_Point | remainings of old SDH meshed network |
| Layer2.0 | L2_TDM | NSF_SDH_Broadcast | SDH unidirectional drop& continue for broadcast |
| Layer2.0 | L2_TDM | NSF_SDH_Regional_Ring | SDH backbone regional clusters |
| Layer2.0 | L2_TDM | NSF_TDM_Access_Line_HighEnd | PDH/SDH equipment at customer premisses for large delivery/collection of high bandwidth |

| | | | |
|---|---|---|---|
| Layer2.0 | L2_TDM | NSF_TDM_Access_Line_LowEnd | copper based equipment at customer premisses for large delivery/collection of small bandwidth |
| Layer2.1 | L2_PACKET BASED | NSF_ADSL_SDSL_Aggregation | ADSL(2+)/SDSL bitstreams collection and aggregation towards ATM or Ethernet transport networks |
| Layer2.1 | L2_PACKET BASED | NSF_ATM_Regional_Transport | ATM regional backbone switching |
| Layer2.1 | L2_PACKET BASED | NSF_ATM_Tributary_Access | Tributary access to ATM backbone switched network |
| Layer2.1 | L2_PACKET BASED | NSF_Ethernet_Access_Line | Ethernet/optical equipment at customer premisses for delivery/collection of high bandwidth VLANs |
| Layer2.1 | L2_PACKET BASED | NSF_Ethernet_Regional_Unicast | Ethernet network for unicast VLAN transport |
| Layer2.1 | L2_PACKET BASED | NSF_Ethernet_Regional_Multicast | Ethernet network for broadcast |
| Layer2.1 | L2_PACKET BASED | NSF_Ethernet_Express_Switching | Ethernet/MPLS switching in backbone express network |
| Layer2.1 | L2_PACKET BASED | NSF_Ethernet_Express_IO | Access to Ethernet/MPLS switching in backbone express network |
| Layer2.1 | L2_PACKET BASED | NSF_Ethernet_first_mile | Ethernet/copper equipment at customer premisses for delivery/collection of low bandwidth VLANs |
| Layer2.1 | BASED | NSF_VDSL_Aggregation | VDSL bitstreams collection and aggregation towards Ethernet transport networks |
| Layer3 | L3_IP | NSF_BroadBand_Public_IP_Collect | Access authentication , data traffic accounting, attribution of public IP address to broadband customers and collection of customer traffic towards public internet service providers |
| Layer3 | L3_IP | NSF_BroadBand_VoD_IP_Collect | Access authentication , data traffic accounting, attribution of IP TV address to IP TV customers and collection of IP video customer traffic towards Video On Demand platforms |
| Layer3 | L3_IP | NSF_BroadBand_VoIP_IP_Collect | Access authentication , data traffic accounting, attribution of Voice over IP address to VoIP customers and collection of Voice over IP customer traffic towards VoIP platforms |
| Layer3 | L3_IP | NSF_Dedicated_Access_to_PrivateIP | |
| Layer3 | L3_IP | NSF_PrivateIPSwitching | IP-VPN switching |
| Layer3 | L3_IP | NSF_PublicInternetSwitching | Public Internet Routing |
| Layer3 | L3_IP | NSF_IP_security | |
| Layer4 | L4_IDTV | NSF_BroadcastTV | |
| Layer4 | L4_IDTV | NSF_VoD | |
| Layer4 | L4_VOICE | NSF_Advanced_Number_Translation_Call Handling | Voice Value Added network function destinated to Business customers |
| Layer4 | L4_VOICE | NSF_CallerIdentity_CallHandling | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_CallingCard_CallHandling | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_InteractiveVoiceResponse_CallHandli ng | Voice Value Added network function |
| Layer4 | L4_VOICE | NSF_InternetDialUp_CallHandling | |
| Layer4 | L4_VOICE | NSF_ISDN_Primary_Access | Access for PRA |
| Layer4 | L4_VOICE | NSF_ISDN_Voice_concentrator | Aggregation of ISDN voice calls towards backbone circuit switching |
| Layer4 | L4_VOICE | NSF_NumberPortability_CallHandling | telephony ported number realtime translation |
| Layer4 | L4_VOICE | NSF_OtherAdvanced_CallHandling | Voice Value Added network function |
| Layer4 | L4_VOICE | NSF_PrepaidCallingCard_CallHandling | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_PSTN_Voice_concentrator | Aggregation of PSTN voice calls towards backbone circuit switching |
| Layer4 | L4_VOICE | NSF_Televoting_CallHandling | Voice Value Added network function destinated to Business customers |
| Layer4 | L4_VOICE | NSF_VirtualPrivateNetwork_CallHandling | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_Voice_call_CAE_charging | generation of call detail records for interoperator voice traffic accounting |

| | | | |
|---|---|---|---|
| Layer4 | L4_VOICE | NSF_Voice_call_CAE_Processing | handling of voice calls at transit level |
| Layer4 | L4_VOICE | NSF_Voice_call_CAE_Trunks | multiplexing/demultiplexing voice circuits at transit level |
| Layer4 | L4_VOICE | NSF_Voice_call_Local_charging | generation of call detail records for customer voice usage charging |
| Layer4 | L4_VOICE | NSF_Voice_call_Local_Processing | handling of voice calls at originating or terminating level |
| Layer4 | L4_VOICE | NSF_Voice_call_Local_Trunks | multiplexing/demultiplexing voice circuits generated/terminated |
| Layer4 | L4_VOICE | NSF_WakeUp_CallHandling | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_MessageWaitingIndicator_Inserting | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_Service_Announcements_Playing | |
| Layer4 | L4_VOICE | NSF_Automated_call_distribution | intelligent distribution of calls towards call center |
| Layer4 | L4_VOICE | NSF_Voicemail&Messaging | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_VoiceFeatures_SelfManaging | Voice Value Added network function destinated to residential customers |
| Layer4 | L4_VOICE | NSF_Public_NumberPortability_Database | telephony ported number repository |
| Layer4 | L4_VOICE | NSF_Payphones | |
| Layer4 | L4_VOICE | NSF_ISDN_NetworkTermination | |
| Layer4 | L4_VOICE | NSF_PairGainSystem | |

All the investment costs of Belgacom SA assets are mapped to these NSF , except investments related with network administration, and some other that cannot be related to any current product or service. The exceptions are not filed into the network allocation cascade , but are allocated like an overhead cost (i.e. with no direct causality) to a range of End User Services (depending on the kind of overhead cost) proportionally to the cascaded costs on these EUS.

Mapping asset cost sources to Asset objects of the model AC2

There are 147 network assets , they are all 1-to-1 allocated to a homonymic AC2 object except for the 7 voice switching assets which are aggregated in AC2_Voice_Switching_Equipment.

Mapping AC2 objects to cost pools or Network elements

**AC2 Aggregation.**

At this stage 140 AC2 asset objects are aggregated into 15 cost pools, 38 network elements , 3 overhead objects and eventually 3 end user services (costs for subsidiaries, marginal end user services , or direct waste).

The aggregations into 15 cost pools serve to form technology pools for which operational inventories can be queried for various statistics that are further used to decompose into network elements. The technology pools typically are (D)WDM equipment, ATM equipment, Copper Cables, Broadband (ADSL/SDSL) equipment, SDH equipment , PDH equipment, Ethernet equipment etc.

The aggregation into 38 network elements concerns assets that are already a network element , and it serves also to gather assets that are individually more detailed than the definition of network elements and that can be easily associated to a network element . Typical examples are IP-VPN assets , broadcast TV assets, Analog Multiplexers, Metallic line testing assets etc.

**AC2 Deaggregation.**

By contrast, a set of 13 AC2 assets are decomposed (deaggregated) into 18 cost pools, 21 Network elements and 1 waste pool.

Among these, 8 assets collect investments on network administration (Hardware and software supervision platforms) and on value added services platforms (IN, messaging, voice mail etc.) ; they need to be decomposed into the network technologies they supervise and into the value added service categories.

⇨ The driver used is the "cumulated historical investment" per technology obtained after deep analysis of historical investment data (TM1 financial reporting tool).

One asset collects internal cabling within technical buildings and is decomposed essentially into the following cost pools CP_Backbone_Coax_cabling, CP_Backbone_Optical_cabling, NE_CopperPairs_cabling.

⇨ The driver used is the "estimated annualized cost" of the cost pools , calculated from a diversity of constituent volumes and corresponding prices (coax/fibre cables, connectors, copper pair cables , cable ways,etc) . The main volumes are extracted from the infrastructure inventory database (ITR), other volumes are derived under assumptions.

The AC2_VoiceSwitching_Equipment asset is decomposed in the three main switching units forming the switched network topology : the Remote Units (acting principally as voice concentrators), the Base units (providing call processing and local switching ), and the Transit Units (providing transit switching).

⇨ The driver used is the "Nbr of equivalent lines" , a unit that is at the basis of the purchase contracts with the switches vendors where purchased switching Unit (Remote, Base, Transit) value is proportional to the equivalent lines installed per switching unit. The driver value is obtained from installed base reporting of the switched voice network.

Deaggregation of cost pools into network elements

In performing the previous steps 25 cost pools are introduced in the model. They are now deaggregated into 58 different Network Elements by means of following drivers:

| ELEMENT | Driver Name | Deaggregated Network elements |
|---|---|---|
| CP_(D)WDM_equipment | EstimatedValue_of_DWDM_Component | electrical-optical_transponders, WDM customer premise equipment, optical multiplexer |
| CP_ATM_Equipment | Underlying AC Cost Composition | ATM backbone switching&backbone trunk, ATM access interfaces |
| CP_Backbone_Coax_cabling | Nbr_Connections | pre-allocated to all inside network elements using coax cabling |
| CP_Backbone_Optical_cabling | Nbr_Connections | pre-allocated to all inside network elements using fibre cabling |
| CP_Copper_Burried_Cables&Splices | CalculatedCurrentValue_of_UnderlyingCopperAsset | distribution cables , feeding cables |
| CP_DSLAM | EstimatedValue_of_DSLAM_Components | splitters, broadband aggregators, ATM/Ethernet aggregators |
| CP_Ducts&Manholes | ActualizedInvestedValue_of_Ducts | Ducts&Manholes for Next Generation Access, Ducts&Manholes for corporate/complex nodes in access |
| CP_EthernetMPLS_equipment | EstimatedValue_of_EthernetMPLS_Component | Ethernet Ports, Ethernet/MPLS switches |
| CP_ETHLTE_Copper | Nbr_Equipment | |

| | | |
|---|---|---|
| CP_IntelligentNetwork_Hardware | EstimatedValue_of_IN_HW_components | Service Control Point hardware, Service ManagementPoint Hardware, CPU, RAM memory , Disk |
| CP_IPVPN_equipment | direct | |
| CP_LTE140M_Optical | Total_installed_bandwidth_capacity(Gbps) | |
| CP_LTE34M_Optical | Total_installed_bandwidth_capacity(Gbps) | |
| CP_Main_Distribution_Frame | direct | |
| CP_Optical_Fibre_Cables | ActualizedInvestedValue_of_FibreCables | Fibre cables for Next Generation Access, Fibre Cables for corporate/complex nodes in access |
| CP_Optical_Frame | Nbr_fibres_installed | Access optical frame, backbone optical frame |
| CP_OSS_PDH | fair split | |
| CP_OSS_VoiceTraffic | fair split | |
| CP_Remote_Optical_platform | EstimatedValue_of_ROP_Components | Housing&powering, copper cabling, fibre cabling |
| CP_SDH | EstimatedValue_of_SDH_Components | Add/Drop Multiplexers at customer sites, Add/Drop Multiplexers in backbone, Special configurations in digital cross-connects |
| CP_VDSL1 | direct | |
| CP_VDSL2 | EstimatedValue_of_VDSL2_components | Host aggregators, VDSL2 central site aggregators |
| CP_VoiceDigital_BaseUnit | %VendorCertifiedValue_of_RemoteUnit_subcomponents | Voice concentration elements, Originating/Terminating Voice call handling elements |
| CP_VoiceDigital_RemoteUnit | %VendorCertifiedValue_of_RemoteUnit_subcomponents | Voice concentration elements, Voice call handling elements |
| CP_VoiceDigital_TransitUnit | %VendorCertifiedValue_of_RemoteUnit_subcomponents | Voice concentration elements, Transit Voice call handling elements |

From Network elements to Network Stage Functions

The previous steps populate the cost model with 86 Network Elements. In the next step , they are allocated to the 84 Network Stage Functions.

Among these, 60 network elements are directly embedded within Network Stage Function (either identical to a NSF or constituent of a NSF ).

| Network Elements per technology | | Network Stage Function | |
|---|---|---|---|
| Technology | Nbr NE in model | Technology | Nbr NSF |
| **(D)WDM** | 2 | (D)WDM | 2 |
| **ALL** | 1 | ALL | 1 |
| **ATM** | 2 | ATM | 2 |
| **ATM&ETHERNET** | 1 | UNSPECIFIED | 1 |
| **BROADBAND** | 6 | BROADBAND | 2 |
| **COPPERPLANT** | 3 | COPPERPLANT | 2 |
| **ETHERNET** | 3 | ETHERNET | 2 |
| **FIBREPLANT** | 1 | COPPERPLANT | 1 |
| | 5 | FIBREPLANT | 5 |
| **IDTV** | 2 | IDTV | 2 |
| **INTERNALPLANT** | 1 | COPPERPLANT | 1 |
| **IP** | 3 | IP | 3 |
| **MWE** | 2 | SDH&PDH | 1 |
| **NGN** | 2 | ETHERNET | 2 |
| **PDH** | 1 | PDH | 1 |
| | 9 | SDH&PDH | 2 |
| **SDH** | 3 | SDH | 2 |

| | | | |
|---|---|---|---|
| | 2 | SDH&PDH | 1 |
| **TMN** | 1 | (blank) | 1 |
| **VOICE** | 1 | BVAS | 1 |
| | 4 | MVAS | 4 |
| | 4 | VOICE | 4 |
| **X25** | 1 | (blank) | 1 |
| **Grand Total** | **60** | | **44** |

The other 26 network elements need to be further decomposed either because they still aggregate a same function deployed in different network stages or because they still aggregate different functions delivering different volumes.

| Network Elements per technology | | Network Stage Function | |
|---|---|---|---|
| **Technology** | **Nbr NE in model** | **NSF_technology** | **Nbr of NSF** |
| **(D)WDM** | 2 | (D)WDM | 6 |
| **BROADBAND** | 1 | BROADBAND | 2 |
| **COPPERPLANT** | 2 | COPPERPLANT | 5 |
| **FIBREPLANT** | 1 | COPPERPLANT | 1 |
| | 2 | FIBREPLANT | 6 |
| **INTERNALPLANT** | 1 | COPPERPLANT | 2 |
| **IP** | 1 | IP | 3 |
| **NGN** | 3 | ETHERNET | 6 |
| **SDH** | 1 | SDH | 5 |
| **VOICE** | 1 | BVAS | 3 |
| | 0 | MVAS | 7 |
| | 4 | VOICE | 11 |
| | 0 | VAS | 1 |
| **VAS** | 6 | BVAS | 18 |
| | 0 | MVAS | 42 |
| | 0 | VAS | 6 |
| **VOIP** | 1 | VOICE | 2 |
| **Grand Total** | **26** | | **126** |

The decomposition of network elements into network stage function is driven by a variety of cost drivers listed below per technology :

| NE_technology | DriverName | DriverName |
|---|---|---|
| **(D)WDM** | cumulated_multiplex_capacity_amount (#lambdas)<br>Used_AddDrop_capacity_amount(#lambdas) | Number of wavelengths capacity x Number of equipment to distribute the cost into regional clusters, core clusters, express clusters<br>Number of wavelengths added or dropped x Number of equipment to distribute the |

| | | |
|---|---|---|
| | | costs to regional , core and express clusters |
| **BROADBAND** | Nbr_Of_Installed_lines_ADSL2+_VDSL1 | |
| **COPPERPLANT** | Nbr_of_pair_position_occupied<br>Nbr_TerminatedPairs | |
| **FIBREPLANT** | %EstimatedValue_of_DuctMaterial&Trenching<br>FairSplit<br>Nbr_kmxFibres | Estimation of cost portion attributable to access duct, backbone ducts and spare ducts |
| **INTERNALPLANT** | Nbr_of_pair_position_occupied | |
| **IP** | Total_tributary_capacity(Gbps) | |
| **NGN** | Broadcast_nonBroadcast_capacity(Gbps)<br>Broadcast_nonBroadcast_Trunk_capacity(Gbps) | |
| **SDH** | EstimatedValue_of_SDH_Clusters | |
| **VAS** | perc_occupation_of_IN_hardware_by_services | |
| **VOICE** | Invested_Amount<br>Nbr_of_equivalueInstalledLines<br>RoutedMin<br>VendorCertifiedValue_of_Originating_Terminating_CallHandling_subcomponents<br>VendorCertifiedValue_of_Transit_Call Handling_subcomponents | |
| **VOIP** | VoIP_call_handling_distribution_local_Area | |

## 7.3 End User Services

The network allocation model terminates when all network stage functions have been allocated to network layer services and when network layer services have been combined into a user level telecommunication service , the End User Service.

The End User must be understood as the telecommunication service party that will pay for the service. In case of a retail service the user is identical to the service consumer (residential service) or to the service provider (business service) , in case of wholesale service , the user is in principle another licensed operator , or a network service provider.

Being composed of network layer services, End User Services may emanate from different levels of network layers since interconnection between network operators is being unbundled . For retail services , the end user telecommunication services may arise from different layers : the more a service is oriented for a specific usage the higher the level of network layers involved. For example IP services are less usage oriented than voice telephony, the latter being a layer 4 service, the former a layer 3 service.

## 7.4 Network services of the passive infrastructure layer : NLS1.0

### 7.4.1 Definition

This layer deals with the physical end-to-end connectivity between customers and the Belgacom Office (access), the physical connectivity inside the Belgacom Office between access equipment and the physical connectivity between Belgacom offices (backbone).

***Access Physical connectivity services (see* Figure 12 *):***

- NLS1_0_Continue_Raw_Copper : internal cabling copper connectivity from Main Distribution Frame to other access active equipment like voice switches, leased lines access equipment, collocated access equipment (of other licensed operators).
- NLS1_0_Continue_Shared_Copper : internal cabling copper connectivity from broadband splitter equipment and collocated access equipment (of other licensed operators)
- NLS1_0_Copper_Localloop_testing : inside copper connectivity and equipment required to perform remote testing of the copper loop.
- NLS1_0_Copper_Splitter : resources to split narrowband and broadband copper physical signal .
- NLS1_0_Copper_Subloop : end to end copper connectivity (copper pair) from the network termination point at the customer premises and a delivery point in the street (street cabinet).
- NLS1_0_Copper_Subloop_testing : outside and inside copper connectivity and equipment required to perform remote testing of the copper subloop.
- NLS1_0_Fibre_connect_to_the_cabinet : end to end fibre optical connectivity between the central sites and the street cabinets.
- NLS1_0_Intercept_Raw_Copper : internal cabling copper connectivity between the Main distribution Frame and Belgacom's Central site broadband access equipment.
- NLS1_0_Intercept_Subloop_Copper : curb level copper connectivity between the street cabinet and Belgacom's street sited broadband access equipment.
- NLS1_0_PowerToTheCurb : outside and inside copper connectivity to transport electrical energy from Belgacom's central sites and Belgacom's street sites.
- NLS1_0_Raw_Copper : end to end copper connectivity (copper pair) from the network termination point at the customer premises and the Central site.
- NLS1_0_Fibre_connect_to_the_office : end to end fibre optical connectivity between the central sites and corporate customers office buildings and Belgacom subtended optical nodes.

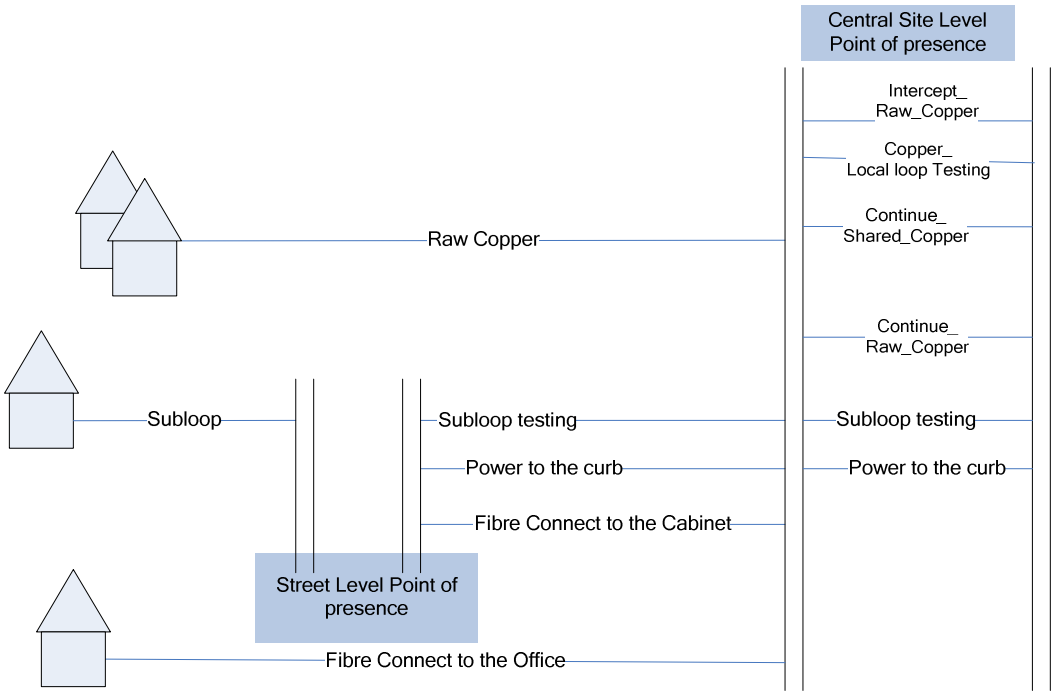



**Figure 12**

***Backbone Physical connectivity services:***

- NLS1_0_Fibre_connect_Backbone_Ethernet_Express_clusters : end to end fibre connectionbetween MPLS equipment of the express MPLS cluster
- NLS1_0_Fibre_connect_Backbone_Ethernet_Regional_clusters : end to end fibre connectionbetween MPLS equipment of the regional MPLS clusters forming the Ethernet aggregation network
- NLS1_0_Fibre_connect_Backbone_Point2Point : end to end fibre connectionbetween (D)WDM clusters and also between residual SDH point to point capacties
- NLS1_0_Fibre_connect_Backbone_SDH_Core_rings : end to end fibre connectionbetween SDH equipment of the core normal SDH clusters
- NLS1_0_Fibre_connect_Backbone_SDH_Express_rings : end to end fibre connectionbetween SDH equipment of the core express SDH clusters
- NLS1_0_Fibre_connect_Backbone_SDH_Regional_rings : end to end fibre connectionbetween SDH equipment of the regional SDH clusters

### 7.4.2 Usage of the passive infrastructure

The physical connectivity services of this layer are used by upper layers in order to interconnect their specific equipment (modelled in the Network Stage Function of that layer). The costs are distributed to the service users according to “consumption drivers” as listed in the next table.

| Network layer Service | Driver | Service consumers |
|---|---|---|
| **NLS1_0_Continue_Raw_Copper** | Nbr_of_used_pairs | BRUO raw copper, Local tails for leased linestype of connectivity, ISDN/PSTN accesses |
| **NLS1_0_Continue_Shared_Copper** | Direct | BRUO Shared pairs |
| **NLS1_0_Copper_Localloop_testing** | nbr of broadband lex based without voice | Broadband bitstream layer 2.1 services |
| **NLS1_0_Copper_Splitter** | Direct | BRUO Shared pairs |
| **NLS1_0_Copper_Subloop** | Direct | VDSL bistream layer 2.1 service |
| **NLS1_0_Copper_Subloop_testing** | Direct | VDSL bistream layer 2.1 service |
| **NLS1_0_Fibre_connect_Backbone_Ethernet_Express_clusters** | Direct | Intercity Pseudowire layer2.1 service |
| **NLS1_0_Fibre_connect_Backbone_Ethernet_Regional_clusters** | Broadcast_nonBroadcast_Trunk_capacity(Gbps) | Layer 2.1 Unicast VLAN s and Broadcast VPLS. |
| **NLS1_0_Fibre_connect_Backbone_Point2Point** | km equivalent fibre pairs consumed | DWDM layer 1.1 networksand Trasnport segments of leased lines/backhaul, Broadcast , |
| **NLS1_0_Fibre_connect_Backbone_SDH_Core_rings** | km*Mbit/s | Trasnport segments of leased lines/backhaul, Broadcast , |
| **NLS1_0_Fibre_connect_Backbone_SDH_Express_rings** | km*Mbit/s | Trasnport segments of leased lines/backhaul, Broadcast , |
| **NLS1_0_Fibre_connect_Backbone_SDH_Regional_rings** | km*Mbit/s | Trasnport segments of leased lines/backhaul, Broadcast , |
| **NLS1_0_Fibre_connect_to_the_cabinet** | Direct | VDSL bistream layer 2.1 service |
| **NLS1_0_Fibre_connect_to_the_office** | Nbr_fibreBundles_Used | Local tails services of layer 2.0 (for leased lines), of layer 2.1 (Ethernet local tails), and of layer 1.1 (optical leased lines) and backbone services delivered by equipment located in subtended optical nodes |
| **NLS1_0_Intercept_Raw_Copper** | Nbr_of_used_pairs_LEXbased_ADSL_VDSL_SharedPair | BRUO shared pair and broadband bistream layer2.1 services |
| **NLS1_0_Intercept_Subloop_Copper** | Direct | VDSL bistream layer 2.1 service |
| **NLS1_0_PowerToTheCurb** | Direct | VDSL bistream layer 2.1 service |
| **NLS1_0_Raw_Copper** | Nbr_of_used_pairs | BRUO raw copper, Local tails for leased linestype of connectivity, ISDN/PSTN accesses |

## 7.4.3 Contributors to the passive infrastructure layer

### *7.4.3.1 Access*

The objective of the access network is the delivery of a connection between our customers and our telecommunication network where all services are implemented.

#### 7.4.3.1.1 From customer premises to central site

The related access network services of the passive infrastructure la yer are based on the following NSF :

- *NSF_Access _to _distribution_pairs_inStreet*
- *NSF_Copper_Distribution_pairs*

are attributed to the copper subloop for VDSL without voice connections and to the raw copper for all other copper connections.

- *NSF_Access_to_feeding_pairs inStreet*
- *NSF_Copper_feeding_pairs*

are attributed to the copper subloop testing for VDSL without voice connections, to power to the curb based on the number of copper pairs used for remote powering of Belgacom's street sites and to the raw copper for all other copper connections.

- *NSF_Access_toFTTC_fibre_in Street*
- *NSF_FTTC_bundle(4or8fibres)*
- *NSF_FTTC_Duct&Manholes*

are attributed to fibre connect to the cabinet (street site Remote optical platform ROP)

- *NSF_FTTO_bundle*
- *NSF_FTTO_Ducts&Manholes*

are attributed to fibre connect to the office (corporate customers building).

- *NSF_Intercept_Distribution_pairs_inStreet*

is attributed to intercept subloop copper.

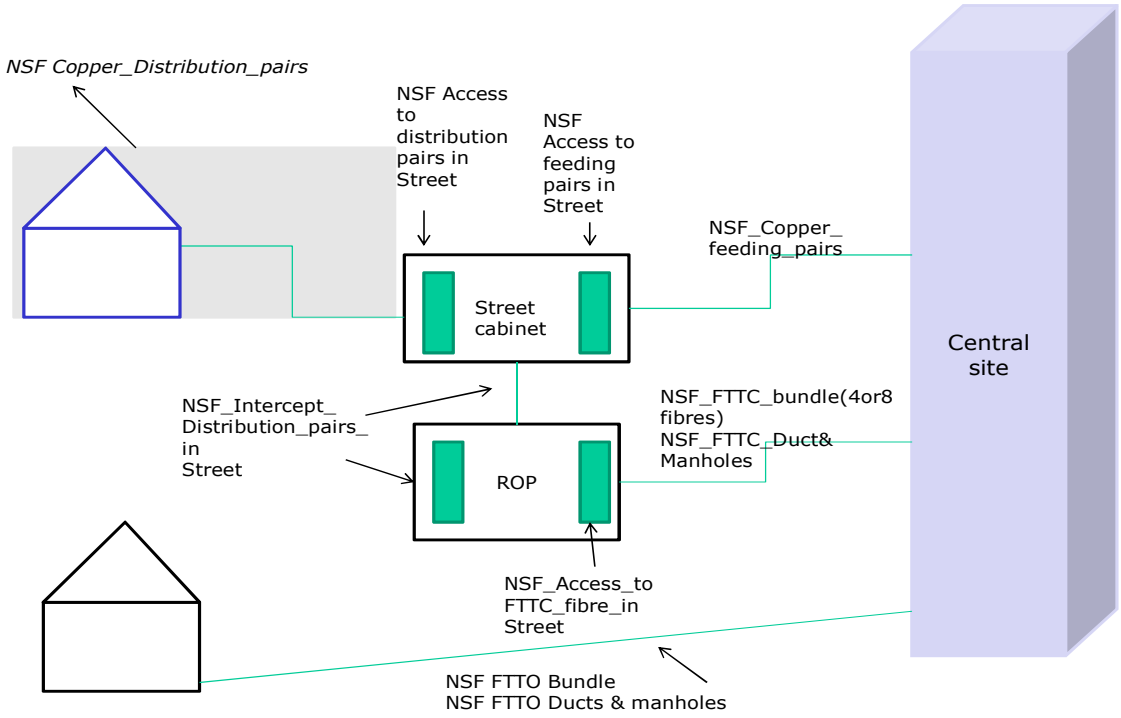



**Figure 13**

#### 7.4.3.1.2 Inside central site

The related access network services of the passive infrastructure layer are based on the following NSF :

*NSF_Access_to_copper_pairs_inTechnicalBuilding*

is attributed to the copper subloop testing for VDSL without voice connections, to power to the curb based on the number of copper pairs used for remote powering of Belgacom's street sites and to the raw copper for all other copper connections.

*NSF_Access_to_FTTx_fibre_inTechnicalBuilding*

is attributed to fibre connect to the cabinet and to fibre connect to the office based on the number of fibres used.

*NSF_Continue feeding pairs in Technical building*

is attributed to :

- continue shared copper based on the number of shared pairs in service,
- copper local loop testing for broadband without voice customers connections at the central site,
- copper subloop testing for VDSL without voice customer connections at the street cabinet,
- power to the curb based on the number of copper pairs used for remote powering of Belgacom's street sites
- continue raw copper for all other copper pairs in use.

*NSF_Intercepts_Feeding_Pairs_inTechnical building*

Is attributed to intercept raw copper, and is used for ADSL customer connections, VDSL2 customer connections central site based and shared pairs.

*NSF_PSTN_Voice_concentrator*

is attributed to :

- copper local loop testing based on the number of broadband without voice customers connections at the central site,
- copper subloop testing for VDSL without voice customer connections at the street cabinet,
- PSTN Access based on the number of subscriptions

Customer connections without voice are connected to the switching equipment in order to perform remote testing of the line.

*NSF_Split_Copper signal*

Is attributed to copper splitter which enables to split narrowband and broadband copper physical signal for shared pairs.

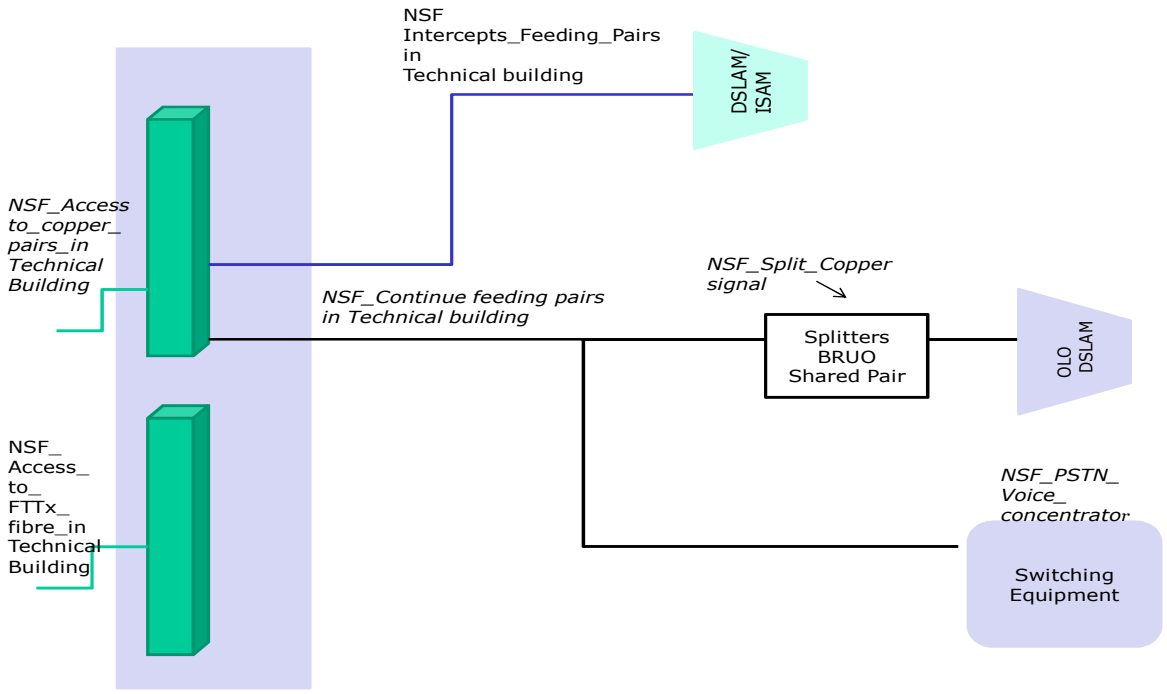



**Figure 14**

### *7.4.3.2 Backbone*

All fibre connectivity services are realized by 9 different Network Stage Functions , essentially resources in the fibre outside plant (ducts&manholes, fibre cables), and optical frame structures allowing to terminate the fibre connectivity within a point of presence (central office or street cabinet level).

The following 5 resources are not shared but directly associated with a connectivity service.

| Network resource | ELEMENT2 |
|---|---|
| NSF_Access_to_FTTC_fibre_inStreet | NLS1_0_Fibre_connect_to_the_cabinet |
| NSF_FTTC_bundle(4or8fibres) | NLS1_0_Fibre_connect_to_the_cabinet |
| NSF_FTTC_Duct&Manholes | NLS1_0_Fibre_connect_to_the_cabinet |
| NSF_FTTO_bundle | NLS1_0_Fibre_connect_to_the_office |
| NSF_FTTO_Duct&Manholes | NLS1_0_Fibre_connect_to_the_office |

The remaining 4 resources are shared and a specific driver allows to distribute each resource to the fibre connectivity services:

| Network resource | Sharing Driver | Connectivity service |
|---|---|---|
| **NSF_Access_to_FTTx_fibre_inTechnical Building** | **Nbr_used_fibres_to_Access (LDC incl.)** | NLS1_0_Fibre_connect_to_the_cabinet |

| | | |
|---|---|---|
| **NSF_Backbone_Duct&Manholes** | **Nbr_km_used_Backbone_tracks** | NLS1_0_Fibre_connect_to_the_office<br>NLS1_0_Fibre_connect_Backbone_Ethernet_Express_clusters<br>NLS1_0_Fibre_connect_Backbone_Ethernet_Regional_clusters<br>NLS1_0_Fibre_connect_Backbone_Point2Point<br>NLS1_0_Fibre_connect_Backbone_SDH_Core_rings<br>NLS1_0_Fibre_connect_Backbone_SDH_Express_rings<br>NLS1_0_Fibre_connect_Backbone_SDH_Regional_rings |
| **NSF_Backbone_Fibre_bundle** | **Nbr_km_used_Backbone_fibre** | NLS1_0_Fibre_connect_Backbone_Ethernet_Express_clusters<br>NLS1_0_Fibre_connect_Backbone_Ethernet_Regional_clusters<br>NLS1_0_Fibre_connect_Backbone_Point2Point<br>NLS1_0_Fibre_connect_Backbone_SDH_Core_rings<br>NLS1_0_Fibre_connect_Backbone_SDH_Express_rings<br>NLS1_0_Fibre_connect_Backbone_SDH_Regional_rings |

## 7.5 Network services of the optical layer (NLS1.1-Services)

### 7.5.1 Definition

This layer treats the end-to-end optical connectivity service between customers and the Belgacom Office (access), and the optical connectivity between Belgacom Offices (backbone).

An end-to-end optical connectivity is an optical wavelength (called “lambda” or a “colour”) established between two distant end points on which any monofibre optical signal can be placed by means of an optical wavelength converter (transponder). (D)WDM optical equipments are deployed and configured to realize such connections and those transponders; they implement the network stage functions of this layer.

**Access**

In the access part, the wavelength connectivity service between a customer site and a central office is modeled as NLS1_1_LocalTail_transparent_Very_highCap(WDM)(incl_BLES), it is distance insensitive since local tails may not discriminate on distance between customer and central site.

**Backbone**

For the connectivity between Belgacom Offices (backbone), different distance stages are distinguished:

| Network Layer Service | Description |
|---|---|
| NLS1_1_Backbone_transparent_Very_highCap_Regiona | coloured wavelength connectivity between |

| | |
|---|---|
| l(DWDM) | "local transmission centers" (regional network) |
| NLS1_1_Backbone_transparent_Very_highCap_Core(DWDM) | coloured wavelength connectivity between "zonal transmission centers" (core network) |
| NLS1_1_Backbone_transparent_Very_highCap_Express(DWDM) | coloured wavelength connectivity in the regional network stage (between "large city transmission centers") |
| NLS1_1_Add_Drop_lambda_Regional | wavelength colouring in local transmission centers |
| NLS1_1_Add_Drop_lambda_Core | wavelength colouring in zonal transmission centers |
| NLS1_1_Add_Drop_lambda_Express | wavelength colouring in large city transmission centers |

### 7.5.2 Usage of the optical infrastructure

The wavelength connectivity services of this layer are used by upper layers in order to interconnect their optical equipment (SDH equipment of the layer2.0 , Ethernet/MPLS equipment of layer 2.1).

For the "colouring/decolouring of wavelength" (add_drop_lambda), the direct consumers are the SDH clusters , the Ethernet/MPLS clusters, the optical leased lines both type of clusters being respectively the NSF of layer 2.0 and 2.1. The cost distribution driver is the nbr of add_drops required by these clusters and optical lines. In the model though, the costs are distributed to the services of the upper layers and not to the network stage function of these layers.That's why the Nbr of add_drops used by the clusters are redistributed to the services implemented by these clusters according to their bandwidth yielding a Nbr of Equivalent Lambdas per service.

Similarly, for the end-to-end wavelength between distant end points, the driver is "Nbr km x lambda" counting the real distances between the wavelength end points .The driver is thus distance sensitive to capture the fact that larger clusters need more wavelength connectivity. The driver "Nbr km x lambda" accounts for the real distances between the wavelength end points occupied by SDH clusters , Ethernet/MPLS clusters, optical leased lines. Here also costs are not distributed to the clusters but to the services realised on these clusters.

That's why the "Nbr km xlambda" used by the clusters are redistributed to the services implemented by these clusters according to their bandwidth yielding a Nbr_of_kmxLambda_equivalent_consumed .

| Network Layer service | **Driver Name** | **Service consumers** |
|---|---|---|
| NLS1_1_Add_Drop_lambda_Core | Nbr_of_equivalent_lambda_add_drops | Nbr of wavelengths occupied by SDH core clusters used by Transport segments of leased lines/backhaul or Broadcast. Ethernet/MPLS aggregation clusters , optical leased lines |
| NLS1_1_Add_Drop_lambda_Express | Nbr_of_equivalent_lambda_add_drops | Nbr of wavelengths occupied by SDH express clusters used by Transport segments of leased lines/backhaul or Broadcast. Ethernet/MPLS express clusters , optical leased lines |
| NLS1_1_Add_Drop_lambda_Regional | Nbr_of_equivalent_lambda_add_drops | Nbr of wavelengths occupied by SDH regional clusters used by Transport segments of leased lines/backhaul or Broadcast. Ethernet/MPLS aggregation clusters , optical leased lines |
| NLS1_1_Backbone_transparent_Very_highCap_Core(DWDM) | Nbr_of_kmxLambda_equivalent_consumed | Nbr of kmx wavelengths occupied by SDH core clusters used by Transport segments of leased |

| | | |
|---|---|---|
| | | lines/backhaul or Broadcast. Ethernet/MPLS aggregation clusters , optical leased lines |
| NLS1_1_Backbone_transparent_Very_highCap_Express(DWDM) | Nbr_of_kmxLambda_equivalent_consumed | Nbr of km x wavelengths occupied by SDH express clusters used by Transport segments of leased lines/backhaul or Broadcast. Ethernet/MPLS aggregation clusters , optical leased lines |
| NLS1_1_Backbone_transparent_Very_highCap_Regional(DWDM) | Nbr_of_kmxLambda_equivalent_consumed | Nbr of km x wavelengths occupied by SDH regional clusters used by Transport segments of leased lines/backhaul or Broadcast. Ethernet/MPLS aggregation clusters , optical leased lines |
| NLS1_1_LocalTail_transparent_Very_highCap(WDM)(incl_BLES) | Nbr_of_lambdas_usedby_customerEquipment | |

### 7.5.3 Contributors to the optical infrastructure.

All end-to-end wavelength connectivity and wavelength colouring services are realized by 7 different Network Stage Functions directly implemented in (D)WDM pieces of equipment

The (D)WDM equipments are deployed in clusters presented in the following picture and form the optical networks. The (D)WDM equipments are interconnected by backbone fibre which is actually a layer 1.0 service. Only the NLS1.0_Fibre_connect_point2Point contributes here , the other Fibre connect services being dedicated to specific clusters not to (D)WDM .

The (D)WDM Network stage functions are directly mapped on the NLS1.1 services as follows :

| Network Stage function | Network service |
|---|---|
| NSF_Access_Add_Drop_Lambda | NLS1_1_LocalTail_transparent_Very_highCap(WDM)(incl_BLES) |
| NSF_Core_Add_Drop_lambda | NLS1_1_Add_Drop_lambda_Core |
| NSF_Core_Optical_Networking | NLS1_1_Backbone_transparent_Very_highCap_Core(DWDM) |
| NSF_Express_Add_Drop_lambda | NLS1_1_Add_Drop_lambda_Express |
| NSF_Express_Optical_Networking | NLS1_1_Backbone_transparent_Very_highCap_Express(DWDM) |
| NSF_Regional_Add_Drop_lambda | NLS1_1_Add_Drop_lambda_Regional |
| NSF_Regional_Optical_Networking | NLS1_1_Backbone_transparent_Very_highCap_Regional(DWDM) |

The fibre interconnection service is distributed to each (D)WDM cluster based on the cumulated length of fibre pairs consumed.

## 7.6 Network services of the transmission infrastructure

### 7.6.1 Definition

This layer deals with the transmission services between customer sites and the Belgacom Offices (access) also called local tail for leased lines , and it deals also with the transport segments services (also called backbone leased lines segments and backhaul capacity) between Belgacom Offices (backbone).

The national wide transmission infrastructure collects transmission traffic in three aggregation stages , local level aggregation (circ 600 locations) , zonal level aggregation (circ 36 locations) , area level aggregation (20 locations) (see Figure 15 - Transport Segments). Traffic at each stage can be crossconnected allowing to create transport segments from any location to any location.

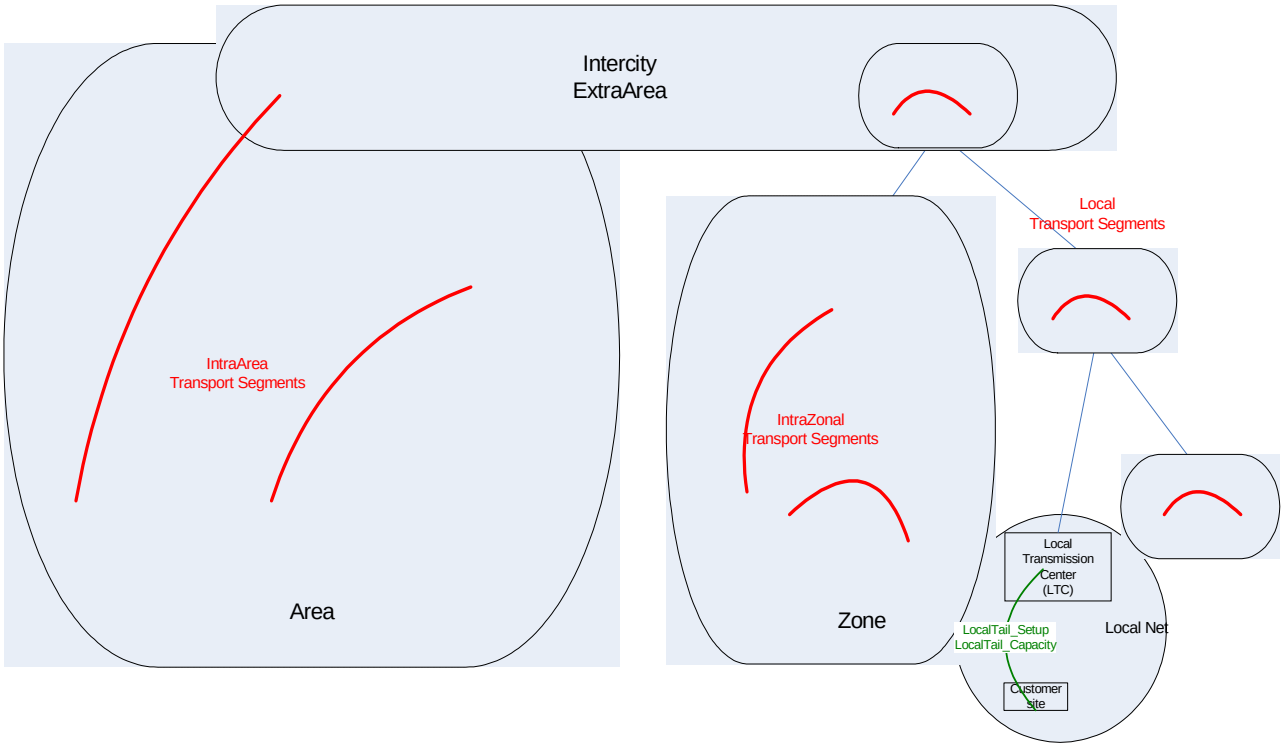



**Figure 15 - Transport Segments**

**Access services**

The transmission between the customer site and the Belgacom Office (access) is handled by two service types:

set-up of a link :

NLS2_0_LocalTail<2M_Setup

NLS2_0_LocalTail=2M_Setup
NLS2_0_LocalTail>2M_Setup

They capture costs that are principally related to the physical dedicated link between the customer site and the central office and also to the fixed cost of equipment needed to activate the link in a capacity category. These cost elements are independent of any additional capacity.

Capacity of a link : NLS2_0_LocalTailCapacity captures the costs for capacity on top of a link.

**Backbone services:**

The backbone transport segments are classified in capacity (or bandwidth) categories: <2Mb/s, 2Mb/s, >2Mb/s combined with distance categories : intraarea > intrazonal > local depending on the end point situation in the aggregation hierarchy.

The following NLS2.0 services are present in the model:

| Network Layer 2.0 service |
|---|
| NLS2_0_LocalBackboneCapacity<2M |
| NLS2_0_LocalBackboneCapacity=2M |
| NLS2_0_LocalBackboneCapacity>2M |
| NLS2_0_IntrazonalBackboneCapacity<2M |
| NLS2_0_IntrazonalBackboneCapacity=2M |
| NLS2_0_IntrazonalBackboneCapacity>2M |
| NLS2_0_IntraAreaBackboneCapacity<2M |
| NLS2_0_IntraAreaBackboneCapacity=2M |
| NLS2_0_IntraAreaBackboneCapacity>2M |
| NLS2_0_InterCityBackboneCapacity<2M |
| NLS2_0_InterCityBackboneCapacity=2M |
| NLS2_0_InterCityBackboneCapacity>2M |
| NLS2_0_InterNationalBackboneCapacity>2M |
| NLS2_0_InterNationalBackboneCapacity<2M |
| NLS2_0_InterNationalBackboneCapacity=2M |
| NLS2_0_BroadCast_Capacity |

### 7.6.2 Usage of the transmission infrastructure

Local tail NLS2.0 services are used to bring transmission capacity to the customer sites and they are thus directly involved in leased line services between two customer sites or leased lines to data services, backhaul services to other licensed operators and monitoring of the access network.

Every leased line consumes one of the set-up services depending on the capacity category it belongs to. The costs of the set-up services are distributed according to the "Nbr_of_sites" (customer sites) per category .

Leased lines also consume the LocalTailCapacity service ; the cost of capacity is allocated to the leased lines according to their bandwidth.

| | Upper layer Consumer or end user service |
|---|---|
| Wholesale transport capacity | EUS_Bandwidth_Wholesale |
| | EUS_BES subscription |
| Regulated wholesale segments | EUS_BROTSOLL_EAA_segment |
| | EUS_BROTSOLL_segment<2M |
| | EUS_BROTSOLL_segment>2M |
| | EUS_BROTSOLL_segment2M |
| Retail&Wholesale leased lines | EUS_LL <2M International |
| | EUS_LL <2M National |
| | EUS_LL >2M International |
| | EUS_LL 2M International |
| | EUS_LL 2M National |
| | EUS_LL Analog International subscription |
| | EUS_LL_Analog National |
| | EUS_X25 |
| Access leased lines to data services (IP-VPN) | NLS3_Private_IP&Ethernet_Extension_on_symmetric_HighEnd |
| | NLS3_Private_IP&Ethernet_Extension_on_symmetric_LowEnd |
| Monitoring lines | OVH_Management_Network |

## 7.6.3 Contributors to the transmission infrastructure

### *7.6.3.1 Local Tail*

A local tail transmission service is made of equipment installed at the customer premises extracting the digital signal from the physical line , of a physical link between the customer site and the central office and of grooming equipment in the central office (or subtended optical nodes). Depending on the bandwidth of the local tail different equipment technologies are installed : PDH on copper , PDH on fibre or SDH on fibre.

For high bandwidth (>2Mb/s) , a fibre based technology is required, for lower bandwidth fibre or copper technology can do. Fibre local links being much more expensive than copper links, low bandwidth local tails will use principally copper based solutions while large bandwidth will use fibre. In addition, equipment used for low rate is not designed to be modular in sub 2M rates , therefore the cost of equipment deployed will depend more on nbr of sites than on bandwidth. By contrast, for large bandwidth optical equipment (SDH and PDH) is modular and can easily be upgraded to higher capacities. The cost of optical equipment is split in a fixed part independent of bandwidth increments and a bandwidth dependent part.

The fixed part of local tails is captured by the NLS2.0_LocalTailxxx_setup service where the capacity category (<2M, =2M,>2M) allows to segregate the underlying physical technology.

Practically the cost of the fixed part emanates directly from the costs of low end equipment collected in layer 2.0 Network Stage function NSF_TDM_Access_Line_LowEnd ,

and from a portion of the costs (estimating the fixed part) of high end equipment collected in layer 2.0 NSF_TDM_Access_Line_HighEnd.

Finally , the costs of physical links ( layer 1.0 services) are added:

| Layer2.0 NSF and lower layer services as cost contributors | Driver Name | Layer2.0 service |
|---|---|---|
| NLS1_0_Continue_Raw_Copper | Nbr_of_used_pairs | NLS2_0_LocalTail<2M_Setup |
| | | NLS2_0_LocalTail=2M_Setup |
| NLS1_0_Fibre_connect_to_the_office | Nbr_fibreBundle_Used | NLS2_0_LocalTail<2M_Setup |
| | | NLS2_0_LocalTail=2M_Setup |
| | | NLS2_0_LocalTail>2M_Setup |
| NLS1_0_Raw_Copper | Nbr_of_used_pairs | NLS2_0_LocalTail<2M_Setup |
| | | NLS2_0_LocalTail=2M_Setup |
| NSF_TDM_Access_Line_HighEnd | Nbr_equivalent_equipment_used | NLS2_0_LocalTail<2M_Setup |
| | | NLS2_0_LocalTail=2M_Setup |
| | | NLS2_0_LocalTail>2M_Setup |
| NSF_TDM_Access_Line_LowEnd | Nbr_of_lines | NLS2_0_LocalTail<2M_Setup |
| | | NLS2_0_LocalTail=2M_Setup |

The variable, bandwidth dependent part costs emanate from the remaining portion of high end optical equipment cost and from the central office grooming equipment costs which are both Network Stage Functions of layer2.0:

| Layer2.0 NSF contributor to NSL2.0 localtailcapacity service | Driver Name | ELEMENT |
|---|---|---|
| NSF_PDH_DigitalCrossConnect | CrossConnected_TimeSlots | NLS2_0_LocalTailCapacity |
| NSF_SDH_DigitalCrossConnect | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) | NLS2_0_LocalTailCapacity |
| NSF_SDH_Grooming | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) | NLS2_0_LocalTailCapacity |
| NSF_SDH_Point_to_Point | Transported_TimeSlots | NLS2_0_LocalTailCapacity |
| NSF_TDM_Access_Line_HighEnd | Nbr_equivalent_equipment_used | NLS2_0_LocalTailCapacity |

### *7.6.3.2 Transport Segments*

Transport segments are realised by configuring the SDH clusters in different network stages. The transmission aggregation levels introduced hereabove (section 7.6.1) are realised by different SDH

clusters (regional SDH rings, core SDH rings, and express SDH rings) interconnected by digital-crossconnects. SDH rings are made of add-drop multiplexers deployed in LTC for the regional ones, in ZTC for the core ones and in the XTC for the express one. Equipments within a ring are linked by fibre or by an optical wavelength.

To summarize the building blocks for the transport segments are:

| | Layer 2.0 Building block | Driver Name to Transport segments |
|---|---|---|
| Layer2.0 Network Stage Function | NSF_PDH_DigitalCrossConnect | CrossConnected_TimeSlots |
| | NSF_SDH_Broadcast | Nbr_TV_users |
| | NSF_SDH_Core_Ring | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | NSF_SDH_Express_Ring | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | NSF_SDH_Regional_Ring | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | NSF_SDH_DigitalCrossConnect | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | NSF_SDH_Grooming | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | NSF_SDH_Point_to_Point | Transported_TimeSlots |
| Physical layer connectivity service | NLS1_0_Fibre_connect_Backbone_Point2Point | km equivalent fibre pairs consumed |
| | NLS1_0_Fibre_connect_Backbone_SDH_Core_rings | km*Mbit/s |
| | NLS1_0_Fibre_connect_Backbone_SDH_Express_rings | km*Mbit/s |
| | NLS1_0_Fibre_connect_Backbone_SDH_Regional_rings | km*Mbit/s |
| | NLS1_0_Fibre_connect_to_the_office | Nbr_fibreBundle_Used |
| Wavelength colouring service | NLS1_1_Add_Drop_lambda_Core | Nbr_of_equivalent_lambda_add_drops |
| | NLS1_1_Add_Drop_lambda_Express | Nbr_of_equivalent_lambda_add_drops |
| | NLS1_1_Add_Drop_lambda_Regional | Nbr_of_equivalent_lambda_add_drops |
| Wavelength end-to-end connectivity service | NLS1_1_Backbone_transparent_Very_highCap_Core(DWDM) | Nbr_of_kmxLambda_equivalent_consumed |
| | NLS1_1_Backbone_transparent_Very_highCap_Express(DWDM) | Nbr_of_kmxLambda_equivalent_consumed |
| | NLS1_1_Backbone_transparent_Very_highCap_Regional(DWDM) | Nbr_of_kmxLambda_equivalent_consumed |

## 7.7 Network services of the packet based infrastructure

### 7.7.1 Definition

This layer deals with the data collection services (broadband or dedicated) between the customer and the central office (access) and the transport of data between central offices (backbone) . Two technologies coexist as well in the access part as in the backbone part : ATM technology and Ethernet/MPLS technology. Next picture summarizes the end point locations of packet based services.

This layer also integrates point to point dedicated Ethernet transparent connections also named BLES services (Belgacom LAN Extension Service).

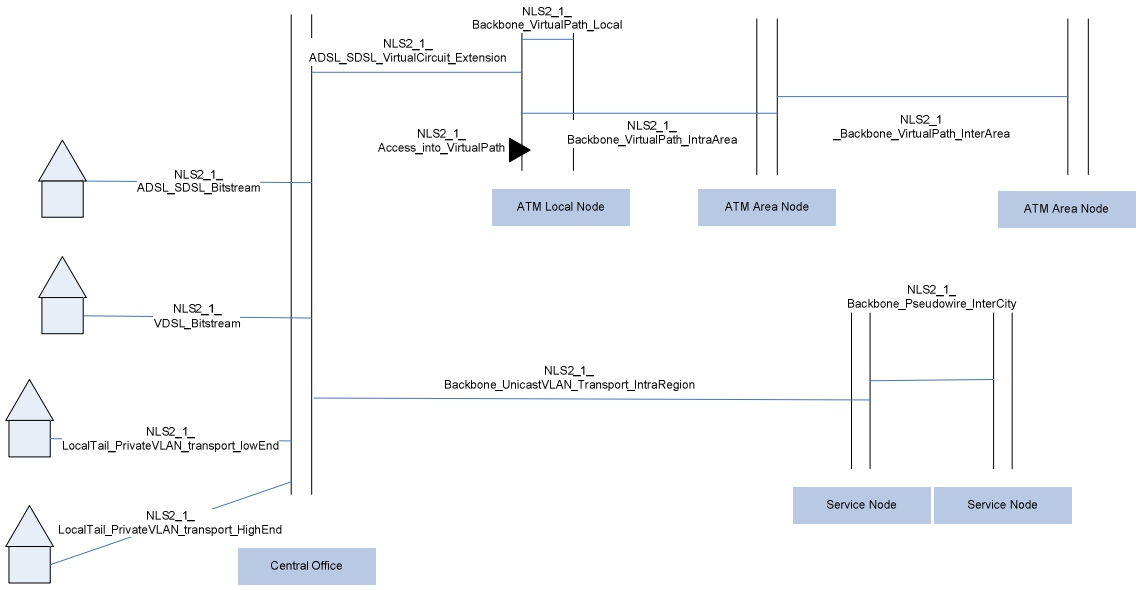



**Figure 16**

**Access part**

| Layer 2.1 access service | Comment |
|---|---|
| NLS2_1_ADSL_SDSL_Bitstream | Broadband (ADSL-SDSL) end to end data streams between customer site and aggregation point in central office |
| NLS2_1_VDSL_Bitstream | Broadband VDSL end to end data streams between customer site and aggregation point in central office |
| NLS2_1_LocalTail_PrivateVLAN_transport_lowEnd | Ethernet symmetric dedicated link with central office over copper |
| NLS2_1_LocalTail_PrivateVLAN_transport_HighEnd | Ethernet symmetric dedicated link with central office over fibre |
| NLS2_1_LocalTailCapacity_Ethernet>=10M | High bandwidth transparent Ethernet frame transport between customer and central office (BLES local tail) |

**Backbone part**

For data transport between central offices, the end point locations of the layer 2.1 services depend on the technology, the underlying networks having different topologies.

For ATM technology , the following services are defined:

| Layer 2.1 ATM transport service | Comment |
|---|---|
| NLS2_1_Backbone_VirtualPath_Local | Transport of virtual circuits in a same ATM path in ATM local point of presence |
| NLS2_1_Backbone_VirtualPath_IntraArea | Transport of virtual circuits in a same ATM path from an ATM local point of presence up to the area level point of presence |
| NLS2_1_Backbone_VirtualPath_InterArea | Transport of virtual circuits in a same ATM path between 2 ATM area level point of presence. |
| NLS2_1_Access_into_VirtualPath | Direct access to a virtual path , allows to inject/eject ATM virtual circuits in/out of a transport virtual path |
| NLS2_1_ADSL_SDSL_VirtualCircuit_Extension | Extension of the virtual circuits between the central offices and the ATM local point of presence |

For the Ethernet/MPLS technology , the following services are defined:

| Layer 2.1 Ethernet transport service | Comment |
|---|---|
| NLS2_1_Backbone_UnicastVLAN_Transport_IntraRegion | MPLS Transport of Ethernet VLANs between a central office and the service node of the region. These VLANs are unicast |
| NLS2_1_Backbone_Pseudowire_InterCity | MPLS Transport of Ethernet VLANs between service nodes of different regions. These VLANs are unicast |
| NLS2_1_Backbone_MulticastVPLS_IntraRegion | |

Eventually , the dedicated Ethernet transparent connections (BLES service) also introduce backbone connectivity services :

| Layer 2.1 Ethernet transparent transport | Comment |
|---|---|
| NLS2_1_LocalBackboneCapacity_Ethernet>=10M | End points are within the same central office |
| NLS2_1_IntrazonalBackboneCapacity_Ethernet>=10M | End points are within central offices of same zone |
| NLS2_1_IntraAreaBackboneCapacity_Ethernet>=10M | End points are within central offices of same area but not within same zone |
| NLS2_1_InterCityBackboneCapacity_Ethernet>=10M | End points are between two express transmission centers |
| NLS2_1_InterNationalBackboneCapacity_Ethernet>=10M | |

### 7.7.2 Usage of the data packet infrastructure

The access services of the data packet infrastructure are combined with the data packet backbone services to deliver end-to-end connectivity between IP appliances at customer site (IP router in ADSL/VDSL modems, private LAN IP routers) and IP service nodes , primarily the broadband access servers and the IPVPN routers offering layer3 services like ADSL/SDSL IP collection, VoD IP collection, Private VLAN extensions up to IPVPN nodes.

Next table summarizes the drivers used expressing how NLS2.1 contribute in layer 3 services or directly to End user services.

| NLS2.1 service | Driver Name | Upper layer services "consuming" NLS2.1 services |
|---|---|---|
| NLS2_1_ADSL_SDSL_Bitstream | Nbr_of_used_xDSL_BROBA_lines | BROBA end user line, all broadband IP collections (public internet, VoD, VoIP), and broadband access to IP VPN |
| NLS2_1_ADSL_SDSL_VirtualCircuit_Extension | perc | Percentage driver to align bitstream costs with BIPT BROBA model. |
| NLS2_1_VDSL_Bitstream | Nbr_of_used_VDSL_lines | all broadband IP collections (public internet, VoD, VoIP), and broadband access to IP VPN |
| NLS2_1_Access_into_VirtualPath | Configured_Bandwidth(Gbps) | Symmetric accesses to IPVPN |
| NLS2_1_Backbone_MulticastVPLS_IntraRegion | direct | For television |
| NLS2_1_Backbone_Pseudowire_InterCity | TotalPeakBandwidth_used(Gbps) | Broadband public IP NLS3 service, VoIP , Broadcast TV, and private IPVPN routing |
| NLS2_1_Backbone_UnicastVLAN_Transport_IntraRegion | EthanePeakHourPeakBandwidth_used(Mbps) | Broadband public IP NLS3 service, VoIP , VoD and access to private IPVPN routing and Ethernet backhaul |
| NLS2_1_Backbone_VirtualPath_InterArea | VP bandwidth Gbps | |
| NLS2_1_Backbone_VirtualPath_IntraArea | VP equivalent bandwidth Gbps (Topological efficiency and QoS aspects are translated in bandwidth +or- committed bandwidth ) | BROBA transport, Broadband public IP NLS3 service, VoIP , VoD and access to private IPVPN routing |
| NLS2_1_Backbone_VirtualPath_Local | VP equivalent bandwidth Gbps (Topological efficiency and QoS aspects are translated in bandwidth +or- committed bandwidth ) | BROBA transport, Broadband public IP NLS3 service, VoIP , VoD and access to private IPVPN routing |
| NLS2_1_InterCityBackboneCapacity_Ethernet>=10M | Bandwidth consumed (Mbit/s) | |
| NLS2_1_InterNationalBackboneCapacity_Ethernet>=10M | Bandwidth consumed (Mbit/s) | |
| NLS2_1_IntraAreaBackboneCapacity_Ethernet>=10M | Bandwidth consumed (Mbit/s) | |
| NLS2_1_IntrazonalBackboneCapacity_Ethernet>=10M | Bandwidth consumed (Mbit/s) | |
| NLS2_1_LocalBackboneCapacity_Ethernet>=10M | Bandwidth consumed (Mbit/s) | |
| NLS2_1_LocalTailCapacity_Ethernet>=10M | Bandwidth consumed (Mbit/s) | BLES EUS services, High capacity accesses to IPVPN, IP-VPN routers interconnection, internal networks routers interconncetion |

| | | |
|---|---|---|
| NLS2_1_LocalTail_PrivateVLAN_transport_HighEnd | direct | Access to IPVPN layer 3 services |
| NLS2_1_LocalTail_PrivateVLAN_transport_lowEnd | direct | Access to IPVPN layer 3 services |

### 7.7.3 Contributors to the data packet infrastructure services

The ATM based layer2.1 services are implemented by the configuration of the ATM network elements (modeled as Network Stage Function) interacting with each other using lower layer connectivity services (see picture Figure 17 - ATM based layer 2.1).

NLS2_1_ADSL_SDSL_Bitstream is the result of the central office (the Belgacom technical building closest to the end customer) based nework stage function **NSF_ADSL_SDSL_Aggregation.**

That function interacts with the broadband CPE equipment (at the customer site) by means of copper connectivity **NLS1_0_Raw_Copper and NLS1_0_Intercept_Raw_Copper and NLS1_0_Copper_Localloop_testing (for the monitoring of copper line).**

NLS2_1_ADSL_SDSL_VirtualCircuit_Extension is the transportation of aggregated bitstream towards the first ATM network function. This NLS2.1 is directly implemented by connectivity services of layer 2.0: NLS2_0_IntrazonalBackboneCapacity=2M, NLS2_0_IntrazonalBackboneCapacity>2M, NLS2_0_LocalBackboneCapacity>2M, NLS2_0_IntraAreaBackboneCapacity>2M, NLS2_0_InterCityBackboneCapacity>2M

NLS2_1_Backbone_VirtualPath_IntraArea is the result of **NSF_ATM_Tributary_Access** to inject the collected traffic into ATM VP , followed by **NSF_ATM_Regional_Transport function implemented in the ATM switching units and ATM backbone interfaces.**

The switching units interact with each other using lower level layer connectivity services: **NLS2_0_IntraAreaBackboneCapacity>2M, NLS2_0_IntrazonalBackboneCapacity<2M, NLS2_0_IntrazonalBackboneCapacity=2M, NLS2_0_IntrazonalBackboneCapacity>2M, NLS2_0_LocalBackboneCapacity<2M, NLS2_0_LocalBackboneCapacity>2M**

NLS2_1_Backbone_VirtualPath_Local is the result of **NSF_ATM_Tributary_Access** to inject the collected traffic into ATM VP , followed by **NSF_ATM_Regional_Transport function implemented in the ATM switching units (no backbone interface as VP remains local in the ATM equipment).**

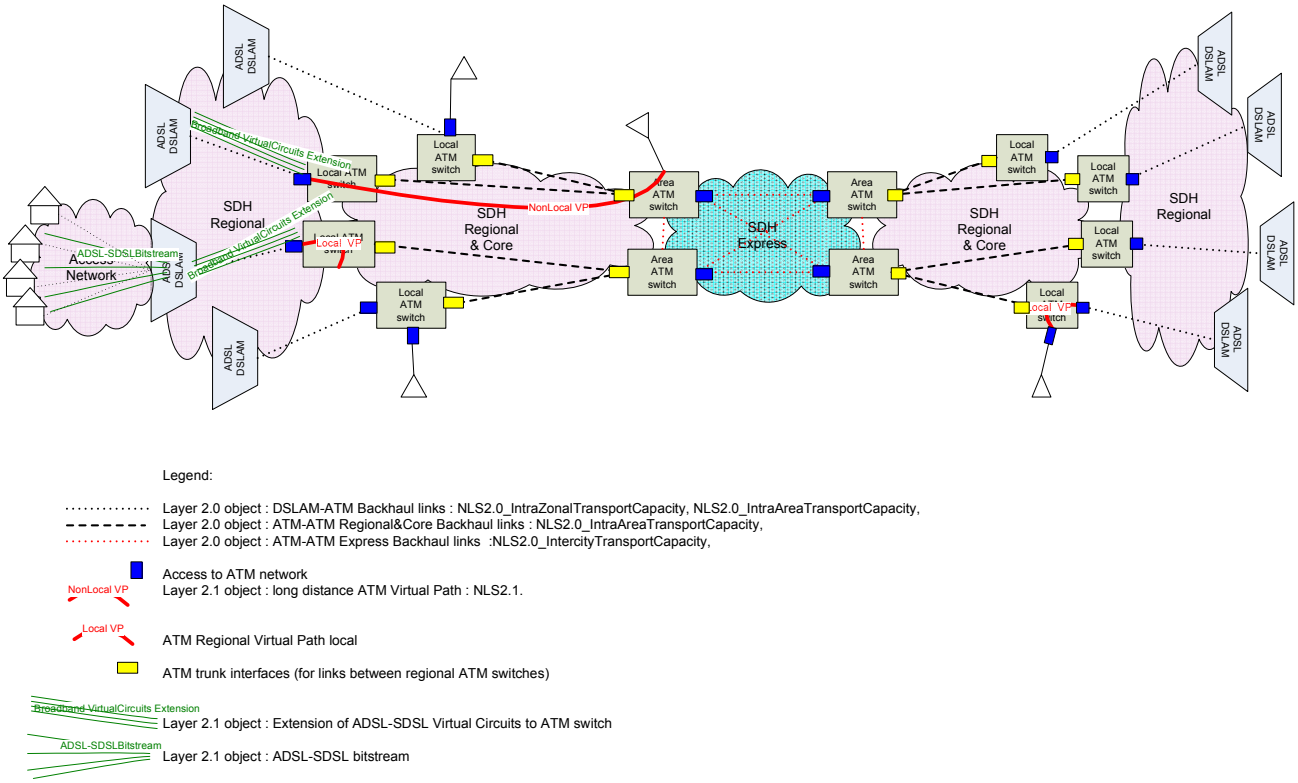



**Figure 17 - ATM based layer 2.1**

The Ethernet based layer 2.1 services are implemented by the configuration of the Ethernet/MPLS network elements (modeled as Network Stage Function) interacting with each other using lower layer connectivity services (see picture Figure 18 - Ethernet layer 2.1) ).

NLS2_1_VDSL_Bitstream is the result of the central office (the Belgacom technical building closest to the end customer) based nework stage function **NSF_VDSL_Aggregation.**

That function interacts with the broadband CPE equipment (at the customer site) by means of copper connectivity **NLS1_0_Raw_Copper,NLS1_0_Intercept_Raw_Copper, NLS1_0_Copper_Localloop_testing (for the monitoring of copper line), NLS1_0_Copper_Subloop, NLS1_0_Intercept_Subloop_Copper, NLS1_0_PowerToTheCurb, NLS1_0_Copper_Localloop_testing, NLS1_0_Fibre_connect_to_the_cabinet, NLS1_0_Fibre_connect_to_the_office (for subtended optical nodes).**

NLS2_1_Backbone_UnicastVLAN_Transport_IntraRegion is the result of the Ethernet/MPLS unicast NSF_Ethernet_Regional_Unicast function present in the deployed Ethernet equipment. The function is activated in different locations to form aggregation clusters , the cluster links are realized using layer 1.1 connectivity (DWDM) and in a limited way direct fibre connectivity.

NLS2_1_LocalTail_PrivateVLAN_transport_HighEnd (LowEnd) are the result of customer sited equipment , the networkstage functions NSF_Ethernet_Access_Line (for high end) and NSF_Ethernet_first_mile (for low end).

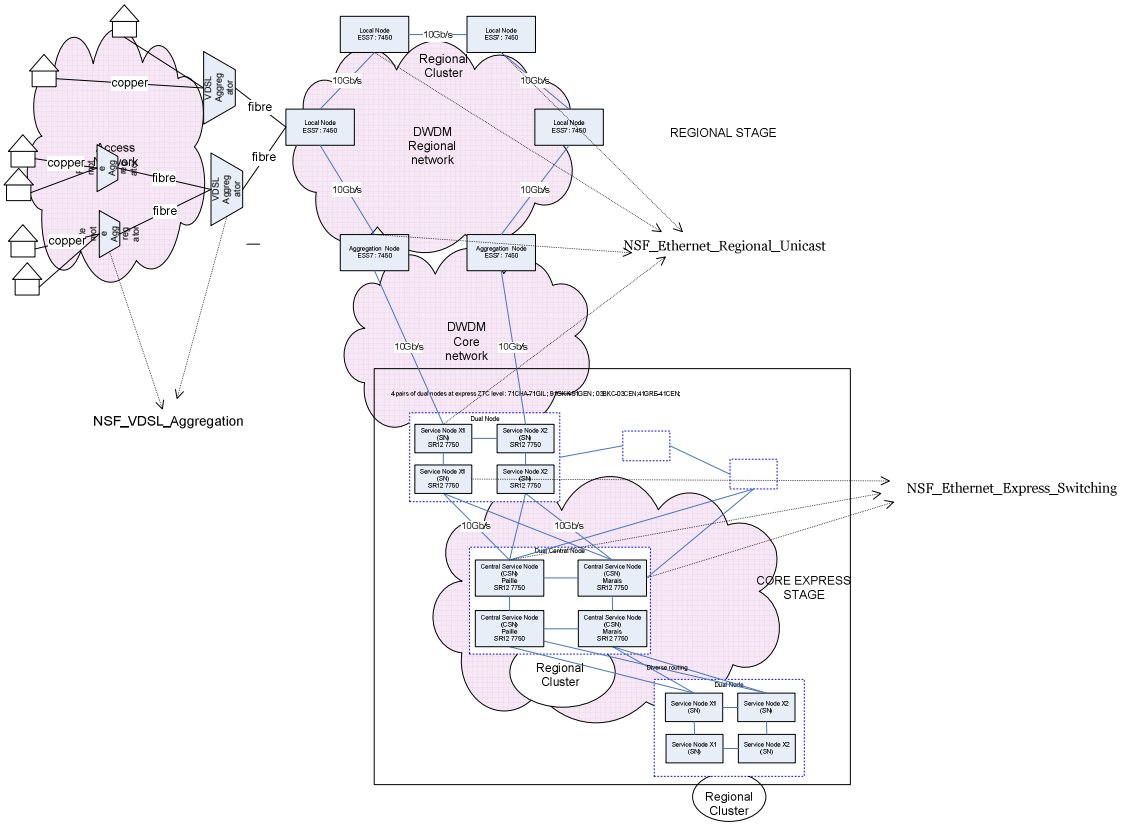



**Figure 18 - Ethernet layer 2.1**

Finally the dedicated Ethernet transparent connection services NLS2_1_LocalTailCapacity_Ethernet>=10M, NLS2_1_XXX_BackboneCapacity_Ethernet>=10M are realized either on SDH equipment (up to 100 Mbps), reusing the SDH clusters deployed and already discussed previously, or for very high capacity connections (above 100 Mbps) they are directly realized on a wavelength using directly the NLS1.1 colouring functions (Add_drop_Lambda) for the local tail and NLS1_1_Backbone_transparent_Very_highCap_XXX for the Backbone service.

The table hereunder summarizes the drivers used to distribute the cost contributors to the NLS2.1 services .

| NLS2.1 service category | Building block of layer 2.1 service | Driver Name |
|---|---|---|
| NLS2_1_Access_into_Vir | NSF_ATM_Tributary_Access | Configured_Bandwidth(Gbps) |

| | | |
|---|---|---|
| **tualPath** | | |
| **Broadband aggregation** | **NLS1_0_Copper_Localloop_testing** | nbr of broadband lex based without voice |
| | **NLS1_0_Copper_Subloop** | Direct |
| | **NLS1_0_Copper_Subloop_testing** | Direct |
| | **NLS1_0_Fibre_connect_Backbone_Point2Point** | km equivalent fibre pairs consumed |
| | **NLS1_0_Fibre_connect_to_the_cabinet** | Nbr_Active_Remote_optical_platforms |
| | **NLS1_0_Fibre_connect_to_the_office** | Nbr_fibreBundle_Used |
| | **NLS1_0_Intercept_Raw_Copper** | Nbr_of_used_pairs_LEXbased_ADSL_VDSL_SharedPair |
| | **NLS1_0_Intercept_Subloop_Copper** | Direct |
| | **NLS1_0_PowerToTheCurb** | Direct |
| | **NLS1_0_Raw_Copper** | Nbr_of_used_pairs |
| | **NLS2_0_IntraAreaBackboneCapacity>2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_IntrazonalBackboneCapacity>2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_LocalBackboneCapacity>2M** | Bandwidth consumed (Mbit/s) |
| | **NSF_ADSL_SDSL_Aggregation** | Nbr_ADSL_SDSL_lines_used |
| | **NSF_ATM_Tributary_Access** | Configured_Bandwidth(Gbps) |
| | **NSF_VDSL_Aggregation** | Nbr_VDSL_lines_used |
| **ATM & Ethernet transport** | **NLS1_0_Fibre_connect_Backbone_Ethernet_Express_clusters** | Direct |
| | **NLS1_0_Fibre_connect_Backbone_Ethernet_Regional_clusters** | Broadcast_nonBroadcast_Trunk_capacity(Gbps) |
| | **NLS1_0_Fibre_connect_to_the_office** | Nbr_fibreBundle_Used |
| | **NLS1_1_Add_Drop_lambda_Core** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Add_Drop_lambda_Express** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Add_Drop_lambda_Regional** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Backbone_transparent_Very_highCap_Core(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS1_1_Backbone_transparent_Very_highCap_Express(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS1_1_Backbone_transparent_Very_highCap_Regional(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS2_0_InterCityBackboneCapacity<2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_InterCityBackboneCapacity>2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_IntraAreaBackboneCapacity>2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_IntrazonalBackboneCapacity<2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_IntrazonalBackboneCapacity=2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_IntrazonalBackboneCapacity>2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_LocalBackboneCapacity<2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_LocalBackboneCapacity>2M** | Bandwidth consumed (Mbit/s) |

| | | |
|---|---|---|
| | **NSF_ATM_Regional_Transport** | Equivalent Switched Amount(Gbps) |
| | **NSF_ATM_Tributary_Access** | Configured_Bandwidth(Gbps) |
| | **NSF_Ethernet_Express_IO** | Consumed_capacity(Gbps) |
| | **NSF_Ethernet_Express_Switching** | Consumed_capacity(Gbps) |
| | **NSF_Ethernet_Regional_Unicast** | Consumed_capacity(Gbps) |
| **NLS2_1_Backbone_MulticastVPLS_IntraRegion** | **NLS1_0_Fibre_connect_Backbone_Ethernet_Regional_clusters** | Broadcast_nonBroadcast_Trunk_capacity(Gbps) |
| | **NLS1_0_Fibre_connect_to_the_office** | Nbr_fibreBundle_Used |
| | **NLS1_1_Add_Drop_lambda_Core** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Add_Drop_lambda_Express** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Add_Drop_lambda_Regional** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Backbone_transparent_Very_highCap_Core(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS1_1_Backbone_transparent_Very_highCap_Express(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS1_1_Backbone_transparent_Very_highCap_Regional(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NSF_Ethernet_Regional_Multicast** | Consumed_capacity(Gbps) |
| **Transparent Ethernet connection services** | **NLS1_0_Fibre_connect_Backbone_Point2Point** | km equivalent fibre pairs consumed |
| | **NLS1_0_Fibre_connect_Backbone_SDH_Core_rings** | km*Mbit/s |
| | **NLS1_0_Fibre_connect_Backbone_SDH_Express_rings** | km*Mbit/s |
| | **NLS1_0_Fibre_connect_Backbone_SDH_Regional_rings** | km*Mbit/s |
| | **NLS1_0_Fibre_connect_to_the_office** | Nbr_fibreBundle_Used |
| | **NLS1_1_Add_Drop_lambda_Core** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Add_Drop_lambda_Express** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Add_Drop_lambda_Regional** | Nbr_of_equivalent_lambda_add_drops |
| | **NLS1_1_Backbone_transparent_Very_highCap_Core(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS1_1_Backbone_transparent_Very_highCap_Express(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS1_1_Backbone_transparent_Very_highCap_Regional(DWDM)** | Nbr_of_kmxLambda_equivalent_consumed |
| | **NLS1_1_LocalTail_transparent_Very_highCap(WDM)(incl_BLES)** | Nbr_of_lambdas_usedby_customerEquipment |
| | **NSF_SDH_Core_Ring** | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | **NSF_SDH_DigitalCrossConnect** | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | **NSF_SDH_Express_Ring** | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | **NSF_SDH_Grooming** | Consumed equivalent bandwidth in regard to reference system(Gb/s) (considering the cost of one TimeSlot in this category) |
| | **NSF_SDH_Point_to_Point** | Transported_TimeSlots |
| | **NSF_SDH_Regional_Ring** | Consumed equivalent bandwidth in regard to reference |

| | | |
|---|---|---|
| | | system(Gb/s) (considering the cost of one TimeSlot in this category) |
| **Ethernet local tail** | **NLS1_0_Continue_Raw_Copper** | Nbr_of_used_pairs |
| | **NLS1_0_Raw_Copper** | Nbr_of_used_pairs |
| | **NSF_Ethernet_Access_Line** | Nbr_EAL_lines_used |
| | **NSF_Ethernet_first_mile** | Nbr_EFM_lines_used |

## 7.8 Network services of the IP infrastructure layer (NLS3-IP)

### 7.8.1 Scope

This layer provides the following basic IP services in the model.

| IP service type | IP service |
|---|---|
| Collection of IP traffic for public internet or internal internet | NLS3_ADSL_Public_IP_collection |
| | NLS3_SDSL_Public_IP_collection |
| | NLS3_VDSL_Public_IP_collection |
| | NLS3_VoD_IP_collection |
| | NLS3_VoIP_IP_collection |
| Public Internet routing | NLS3_Public_IP_switching |
| Connection of IP sites to IP-VPN | NLS3_Private_IP&Ethernet_Extension_on_symmetric_HighEnd |
| | NLS3_Private_IP&Ethernet_Extension_on_symmetric_LowEnd |
| | NLS3_Private_IP&Ethernet_Routing |
| | NLS3_Private_IP&Ethernet_Extension_on_asymmetric |
| | NLS3_Private_IP&EThernet_Extension_on_symmetric_Datacenter |
| IP security | NLS3_IP_security |

The actual NLS3's are described next. A comprehensive listing of which NLS or EUS they contribute to together with a description of the driver utilized in each case is also presented. Finally, a table will exhibit the cost allocation of these layer services, including driver and driver volume.

#### *7.8.1.1 Public services*

##### 7.8.1.1.1 IP_collection

Gathers all the data traffic, except that of the private networks, generated by the customers at their locations -homes and offices placed all over the country- at the highest network level where it can be further delivered to the Internet.

This gathering is achieved thanks to the broad and narrow band servers together with the connectivity capabilities of the ATM and MPLS backbone networks.

This generic service is in fact divided in several actual NLS3, depending on the traffic type and/or underlying technology, as follows:

- Data traffic:
  - NLS3_ADSL_Public_IP_Collection
  - NLS3_SDSL_Public_IP_Collection
  - NLS3_VDSL_Public_IP_Collection
- Video on Demand traffic:
  - NLS3_VoD_IP_Collection
- Voice over IP traffic:
  - NLS3_VoIP_IP_Collection

Further, these NLS3's contribute to the following higher network layer services and end user services (EUS) and they do it as specified hereunder:

- Each of the "data traffic" IP collection contributes to the EUS_FastInternet and the corresponding EUS_xDSL_Carrier_wholesale, according to its technology. The cost allocation of each NLS3 into the peer EUS is done based on the driver "Nbr_of_retail_wholesale_xDSL_lines" -where the "x" must be substituted by the appropriate letter according to the treated technology- so that the cost proportion of the retail lines will be allocated to EUS_FastInternet and that of the wholesale lines to EUS_xDSL_Carrier_wholesale.
- NLS3_VoD_IP_Collection and NLS3_VoIP_IP_Collection and directly, fully and respectively allocated to NLS4.0_VoD and NLS4.0_VoIP.

#### 7.8.1.1.2 Public_IP_switching

This service brings the intelligence to route the gathered traffic by the "IP_collection" generic NLS3 into the appropriate external network within the "public Internet".

This service, NLS3_Public_IP_switching, is fully and exclusively realized by the Belgacom Internet Routers and is totally dedicated to the end user service EUS_Fast_Internet.

### *7.8.1.2 Private services*

#### 7.8.1.2.1 Private_IP&Ethernet_Extension

This NLS transparently extends the customer's private local area networks, situated at any location within Belgium, to the edge of the Belgacom's network, thanks to the routers installed at the customer premises (CPE) and the connectivity capabilities of the ATM and MPLS aggregation and core- clouds.

This generic service consists in fact of several actual services, specific to the access technology type, as follows:

- NLS3_Private_IP&Ethernet_Extension_on_symmetric_Datacenter
- NLS3_Private_IP&Ethernet_Extension_on_asymmetric
- NLS3_Private_IP&Ethernet_Extension_on_symmetric_lowEnd
- NLS3_Private_IP&Ethernet_Extension_on_symmetric _highEnd

Regarding the higher level NLS/EUS to which the above NLS3's deliver their services and their costs allocations:

- The "Extension_on_symmetric_Datacenter" service only supports the EUS_Private_IP&EThernet_on_symmetric_Datacenter and therefore the NLS costs are fully allocated to the EUS (Driver=>direct).
- Each of the remaining three NLS3's offers its services to its analogous "EUS_Private_IP&Ethernet…" and to EUS_Private_IP&Ethernet_on_backup. The NLS costs are allocated according to the number of main and backup accesses, respectively. This driver is generically named "Nbr_sites_xxxx", where *xxxx* needs to be replaced by the appropriate collection of access technologies depending on the addressed NLS3, i.e. Nbr_sites_ADSL_VDSL.

#### 7.8.1.2.2 NLS3_Private_IP&Ethernet_Routing

This NLS delivers the capability of routing the private networks traffic to the requested end point, within the Belgacom private IPVPN network.

This service, NLS3_Private_IP&Ethernet_Routing, is completed by the Belgacom IPVPN Routers and the core MPLS cloud and, in turn, supports all the "EUS_Private_IP&Ethernet…".

The costs of this NLS3 are distributed over all the target EUS according to the amount of traffic routed by the Belgacom Private IP network at its busy hour that is generated by the corresponding collection of accesses types (i.e. international, asymmetric, etc…) to the EUS. This driver is named "TotalPeakBandwidth_used(Gbps)".

Figure 19 exhibits the layer's basic topology and all the contributors to the Layer 3 services.

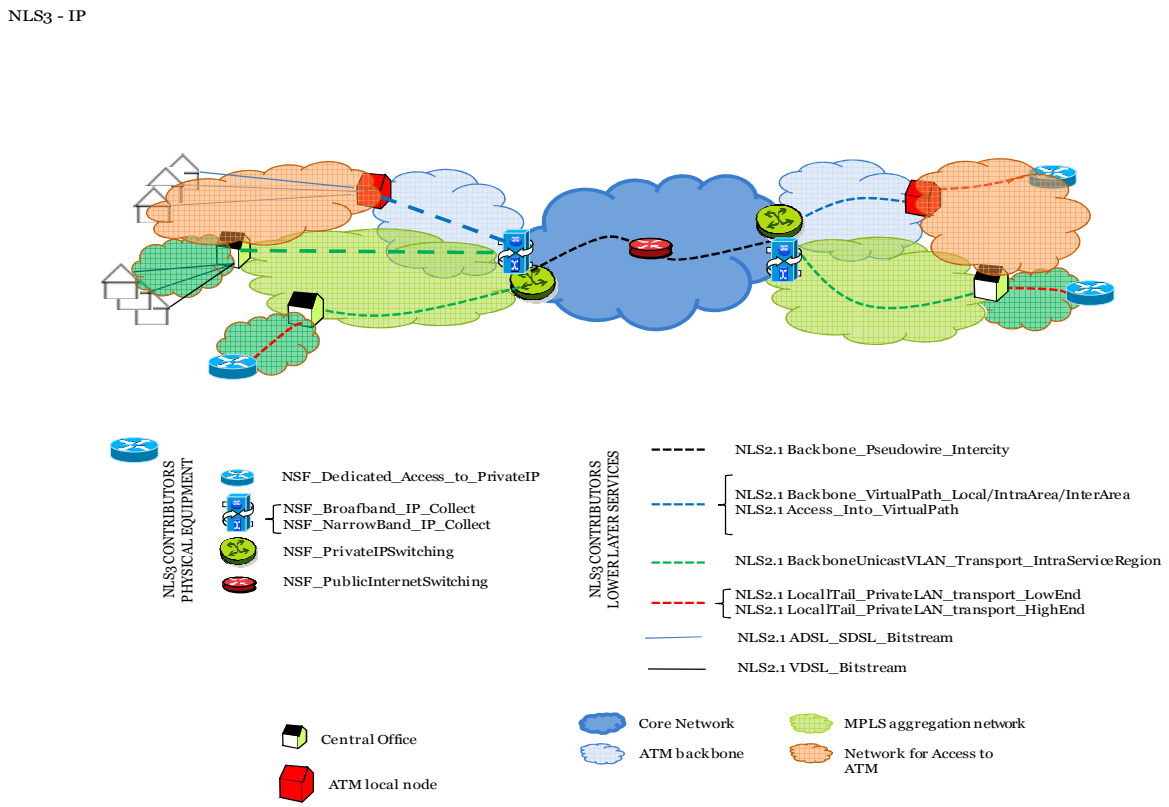



**Figure 19: Layer 3 topology and contributors**

## 7.8.2 Contributors to the Network Layer 3 services

### *7.8.2.1 Components (Physical equipment)*

At this layer, a clear distinction appears between the equipment and offered services for private/corporate networks, namely IP-VPN services, and that for the public network.

- Related to private networks:
  -  Customer Premises Equipment (CPE): This is to say the switches/routers located at the customer's premises all over the country. Their costs are grouped into the NSF_Dedicated_Access_to_PrivateIP.

    Since the costs borne by this NSF are allocated to several NLS3's, as follows:

    - NLS3_Private_IP&Ethernet_Extension_on_asymmetric
    - NLS3_Private_IP&Ethernet_Extension_on_symmetric_LowEnd
    - NLS3_Private_IP&Ethernet_Extension_on_symmetric_HighEnd

    the driver for such allocation is the number of accesses for the corresponding access type (asymmetric, symmetric…). This driver is named "Nbr_of_Sites".

  -  Provider Edge (PE) routers for IPVPN or VPLS: These MPLS routers, located at major Belgacom regional nodes distributed throughout the country, carry out the actual corporate networks data routing. The Network Stage Function NSF _PrivateIPSwitching bears their total costs.
- Related to the "public" network:
  -  Network Access Servers: ensure the authentication and authorization of the users, control the users' down and upstream, concentrate the traffic received from the access side and routes it towards the right ISP. Belgacom utilizes two types:
    - BAS and MSR (Broadband Access Server & Multi Service Router): their costs are allocated into different NSF depending on the traffic type:
      - NSF_Broadband_Public_IP_Collect
      - NSF_Broadband_VoD_IP_Collect
      - NSF_Broadband_VoIP_IP_Collect

      The driver used for such distribution is the "Total_tributary_capacity(Gbps)", which is installed I/O capacity on the equipment interface for each type of traffic.

      Further, these NSF are allocated into NLS3's as follows:

      - NSF_Broadband_Public_IP_Collect is distributed through all the NLS3_xDSL_Public_IP_Collection services, where the x stands for any of the three possible DSL flavors –ADSL, SDSL, VDSL-. The driver used in this case is "PeakHour_PublicInternetTraffic(Gbps)", meaning that the costs will be allocated according to the amount of internet traffic carried by the Belgacom public network at the internet traffic busy hour generated by the different DSL types.
      - NSF_Broadband_VoD_IP_Collect is directly allocated to NLS3_VoD_IP_Collection, although the driver

"PeakHour_VoDTraffic(Gbps)" –carried VoD traffic at the VoD busy hour- has been assigned to it.

- NSF_Broadband_VoIP_IP_Collect: direct allocation to NLS3_VoIP_IP_Collection.

▪ "NarrowBandAccessServer": the costs are grouped into NE_NarrowbandAccessServer and directly allocated to NSF_NarrowBand_IP_Collect

o  Collection of IP equipments -FIFA routers, acting as gateway to the "Public Internet" and located at a very reduced number of key Belgacom technical buildings. Their costs are summed up into the Network Stage Function NSF_PublicInternetSwitching which in turn are directly allocated to NLS3_Public_IP_switching via the driver "TotalPeakHour_PublicInternetTraffic(Gbps)", that is to say retail Internet traffic at Internet Busy Hour.

#### *7.8.2.2 Lower layer services*

At this layer, the clouds provide the NLS3's with connectivity, allowing the transmission of data amongst the Layer 3 equipments. The clouds deliver services to both private and public service meanwhile the tails are specific to the private networks. These clouds are:

- ATM based cloud  :
  - NLS2.1_ADSL_SDSL_Bitstream
  - NLS2.1_VDSL_Bitstream
  - NLS2.1_Access_into_VirtualPath
- Ethernet based cloud  :
  - NLS2.1_Backbone_UnicastVLAN_Transport_IntraServiceRegion
  - NLS2.1_Backbone_Pseudowire_InterCity
- Access network  :
  - NLS2.1_LocalTail_PrivateVLAN_transport_lowEnd
  - NLS2.1_LocalTail_PrivateVLAN_transport_HighEnd

These clouds are described in their corresponding layer.

## 7.9 Network Services of the application layer

### 7.9.1 Definition

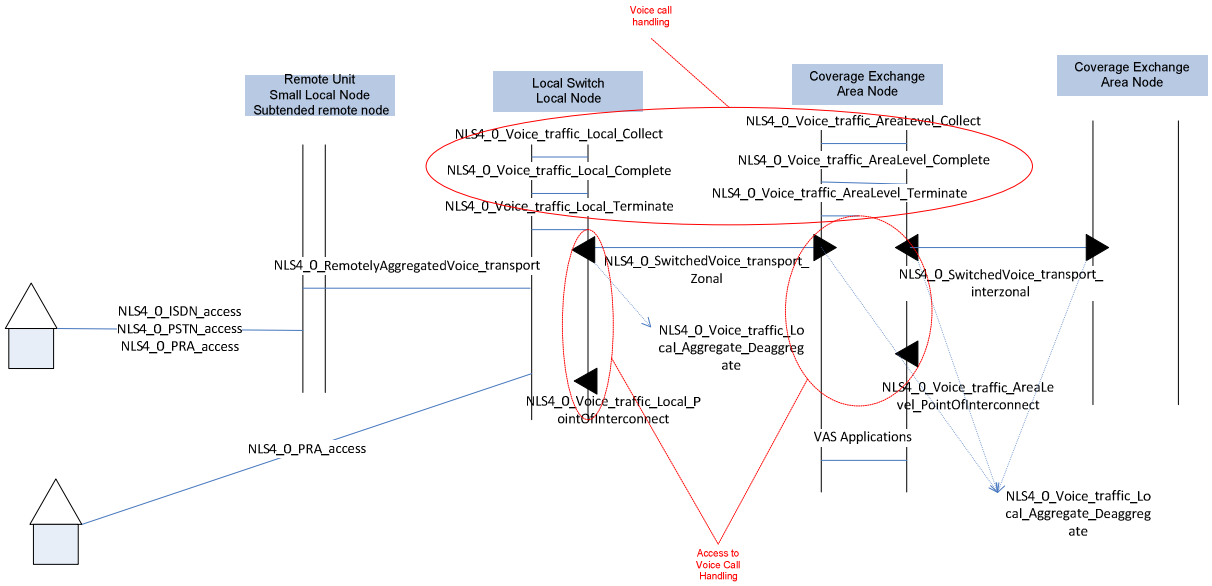
This layer deals with the telecommunication application services to end users. The application layer services are :

NLS4_0_BroadcastTV, NLS4_0_VoD and 36 voice telephony related services classified as follows:

| CLASS | DEF_NLS_DESCR |
|---|---|
| NP | NLS4_0_FixedPortableNumberLocation |

| | |
|---|---|
| | NLS4_0_Public_NumberPortability |
| **Special** | NLS4_0_Automated_call_distribution |
| | NLS4_0_PublicPayphones |
| **Telephony Access** | NLS4_0_ISDN_access |
| | NLS4_0_ISDN-PRA_access |
| | NLS4_0_PSTN_access |
| **VAS application** | NLS4_0_Advanced_Number_Translation_CallHandling |
| | NLS4_0_CallerIdentity_CallHandling |
| | NLS4_0_CallingCard_CallHandling |
| | NLS4_0_InteractiveVoiceResponse_CallHandling |
| | NLS4_0_MessageWaitingIndicator_Inserting |
| | NLS4_0_OtherAdvanced_CallHandling |
| | NLS4_0_PrepaidCallingCard_CallHandling |
| | NLS4_0_Service_Announcements_Playing |
| | NLS4_0_Televoting_CallHandling |
| | NLS4_0_VirtualPrivateNetwork_CallHandling |
| | NLS4_0_VoiceFeatures_SelfManaging |
| | NLS4_0_Voicemail&Messaging |
| | NLS4_0_WakeUp_CallHandling |
| **Access to VoiceCallHandling** | NLS4_0_Voice_traffic_AreaLevel_Aggregate_Deaggregate |
| | NLS4_0_Voice_traffic_AreaLevel_PointOfInterconnect |
| | NLS4_0_Voice_traffic_Local_Aggregate_Deaggregate |
| | NLS4_0_Voice_traffic_Local_PointOfInterconnect |
| **VoiceCallHandling** | NLS4_0_Voice_traffic_AreaLevel_Collect |
| | NLS4_0_Voice_traffic_AreaLevel_Complete |
| | NLS4_0_Voice_traffic_AreaLevel_Terminate |
| | NLS4_0_Voice_traffic_AreaLevel_Transit |
| | NLS4_0_Voice_traffic_Local_Collect |
| | NLS4_0_Voice_traffic_Local_Complete |
| | NLS4_0_Voice_traffic_Local_Terminate |
| **Voice transport** | NLS4_0_RemotelyAggregatedVoice_transport |
| | NLS4_0_SwitchedVoice_transport_interzonal |
| | NLS4_0_SwitchedVoice_transport_National_offnet |
| | NLS4_0_SwitchedVoice_transport_zonal |

For the access, the voice application services are end-to-end voice connections between the customer site and the central office (technical building closest to the user) . For the backbone voice applications are either pure call handling related and do not span over distant nodes, or they are voice transport applications between distant nodes . Next picture puts into perspective the services of the Voice application layer.




## 7.9.2 Usage of the application layer

The TV related applications are completely used for iDTV end-user services, no specific consumption driver needs to be defined.

The voice application services are distributed to a variety of traffic types , each with a specific driver. The following table summarizes the used drivers per voice application service.

| Class of application service | Voice application service | Driver to distribute the NLS4.0 application service to EUS or NLS4.1 |
|---|---|---|
| Access to VoiceCallHandling | NLS4_0_Voice_traffic_AreaLevel_Aggregate_Deaggregate | routed min |
| | NLS4_0_Voice_traffic_AreaLevel_PointOfInterconnect | TimeSlotEquivalent_capacity_used |
| | NLS4_0_Voice_traffic_Local_Aggregate_Deaggregate | routed min |
| | NLS4_0_Voice_traffic_Local_PointOfInterconnect | TimeSlot_capacity_used |
| NP | NLS4_0_FixedPortableNumberLocation | Nbr_calls |
| | NLS4_0_Public_NumberPortability | Nbr_of_ported_numbers |
| Telephony Access | NLS4_0_ISDN_access | Nbr_lines_inUse |
| | NLS4_0_ISDN-PRA_access | Nbr_lines_inUse |
| | NLS4_0_PSTN_access | Nbr_lines_inUse |
| VAS application | NLS4_0_Advanced_Number_Translation_CallHandling | NumberTranslationProcessedTime(min) |
| | NLS4_0_CallerIdentity_CallHandling | Direct |
| | NLS4_0_CallingCard_CallHandling | Direct |
| | NLS4_0_InteractiveVoiceResponse_CallHandling | Direct |
| | NLS4_0_MessageWaitingIndicator_Inserting | Direct |
| | NLS4_0_OtherAdvanced_CallHandling | Direct |
| | NLS4_0_PrepaidCallingCard_CallHandling | Direct |
| | NLS4_0_Service_Announcements_Playing | Nbr_calls |
| | NLS4_0_Televoting_CallHandling | Nbr_calls_explosive_traffic |

| | | |
|---|---|---|
| | NLS4_0_VirtualPrivateNetwork_CallHandling | Direct |
| | NLS4_0_VoiceFeatures_SelfManaging | Direct |
| | NLS4_0_Voicemail&Messaging | Direct |
| | NLS4_0_WakeUp_CallHandling | Direct |
| Voice transport | NLS4_0_RemotelyAggregatedVoice_transport | routed min |
| | NLS4_0_SwitchedVoice_transport_interzonal | routed min |
| | NLS4_0_SwitchedVoice_transport_National_offnet | TimeSlotEquivalent_capacity_used |
| | NLS4_0_SwitchedVoice_transport_zonal | routed min |
| VoiceCallHandling | NLS4_0_Voice_traffic_AreaLevel_Collect | routed min |
| | NLS4_0_Voice_traffic_AreaLevel_Complete | routed min |
| | NLS4_0_Voice_traffic_AreaLevel_Terminate | routed min |
| | NLS4_0_Voice_traffic_AreaLevel_Transit | routed min |
| | NLS4_0_Voice_traffic_Local_Collect | routed min |
| | NLS4_0_Voice_traffic_Local_Complete | routed min |
| | NLS4_0_Voice_traffic_Local_Terminate | routed min |

The driver "routed minutes" consists in determining the average nbr of times (=routing factor) a traffic type is using the voice application service across all possible call scenarios compatible with the traffic type. The routed minutes result from multiplication of the routing factor with the amount of calls (expressed in minutes) of that traffic type.

The traffic types ("consumers") of these voice applications are:

| **Class of voice application** | Traffic type |
|---|---|
| **Access to VoiceCallHandling** | |
| | EUS_Carrier PreSelection IAA interconnection |
| | EUS_Consultel 090x Traffic |
| | EUS_DCIA traffic |
| | EUS_EAA interconnection - BGC to Fixed |
| | EUS_EAA interconnection - BGC to Mobile |
| | EUS_Freephone Traffic |
| | EUS_IAA interconnection - Mobile to BGC |
| | EUS_IAA interconnection - BGC to Mobile |
| | EUS_interzonal traffic |
| | EUS_National Transit (M)OLO traffic EAA interconnection |
| | EUS_Split Charging Traffic |
| | EUS_Universal Access Number Traffic |
| | EUS_Voice_traffic_IAA_PointOfInterconnect |
| | EUS_Voice_traffic_Local_PointOfInterconnect |
| | EUS_zonal non local traffic |
| | NLS4_1_EAA interconnection - Fixed to BGC |
| | NLS4_1_EAA interconnection - Mobile to BGC |
| | NLS4_1_IAA interconnection - BGC to Fixed |
| | NLS4_1_IAA interconnection - Fixed to BGC |
| | NLS4_1_Incoming International Traffic |
| | NLS4_1_INTERNET TRAFFIC |
| | NLS4_1_Outgoing International Traffic |
| | NLS4_1_Transit International (M)OLO Traffic EAA |

| | |
|---|---|
| **NP** | EUS_IAA interconnection - BGC to Fixed<br>EUS_Incoming International Transit (M)OLO Traffic<br>EUS_National Transit (M)OLO traffic EAA interconnection<br>EUS_National Transit (M)OLO traffic IAA interconnection<br>EUS_Number Portability access per line<br>EUS_Other_Traffic |
| **Special** | EUS_AUTOMATEDCALLDISTRIBUTION<br>EUS_Payphones |
| **Telephony Access** | EUS_ISDN-BA normal subscription<br>EUS_ISDN-PRA subscription<br>EUS_Private_IP&Ethernet_on_backup<br>EUS_PSTN subscription |
| **VAS application** | |
| | EUS_Calling Card Postpaid Traffic<br>EUS_Calling Card Prepaid Traffic<br>EUS_Carrier PreSelection IAA interconnection<br>EUS_Carrier PreSelection local interconnection<br>EUS_Consultel 090x Traffic<br>EUS_Consultel 090x Traffic - BGC to Fixed<br>EUS_Consultel 090x Traffic - OLO to BGC<br>EUS_Freephone Traffic<br>EUS_Freephone Traffic - BGC to Fixed<br>EUS_Freephone Traffic - OLO to BGC<br>EUS_IAA interconnection - Mobile to BGC<br>EUS_IAA interconnection - BGC to Mobile<br>EUS_Incoming International Freephone Traffic<br>EUS_Incoming International Transit (M)OLO Traffic<br>EUS_international traffic incoming<br>EUS_Local interconnection - OLO to BGC<br>EUS_local traffic<br>EUS_MVAS<br>EUS_National Transit (M)OLO traffic EAA interconnection<br>EUS_National Transit (M)OLO traffic IAA interconnection<br>EUS_notAllocated<br>EUS_Other_Traffic<br>EUS_Outgoing International Freephone traffic<br>EUS_Outgoing International Transit (M)OLO Traffic<br>EUS_Split Charging Traffic<br>EUS_Split Charging Traffic - BGC to Fixed<br>EUS_Split Charging Traffic - OLO to BGC<br>EUS_Universal Access Number Traffic<br>EUS_Universal Access Number Traffic - BGC to Fixed<br>EUS_Universal Access Number Traffic - OLO to BGC<br>EUS_zonal non local traffic<br>NLS4_1_IAA interconnection - BGC to Fixed<br>NLS4_1_IAA interconnection - Fixed to BGC<br>NLS4_1_interzonal A traffic<br>NLS4_1_interzonal B traffic<br>NLS4_1_Outgoing International Traffic |

| | |
|---|---|
| **Voice transport** | EUS_Carrier PreSelection IAA interconnection<br>EUS_Carrier PreSelection local interconnection<br>EUS_Consultel 090x Traffic<br>EUS_DCIA traffic<br>EUS_EAA interconnection - BGC to Fixed<br>EUS_EAA interconnection - BGC to Mobile<br>EUS_Freephone Traffic<br>EUS_IAA interconnection - Mobile to BGC<br>EUS_IAA interconnection - BGC to Mobile<br>EUS_interzonal traffic<br>EUS_Local interconnection - OLO to BGC<br>EUS_local traffic<br>EUS_National Transit (M)OLO traffic EAA interconnection<br>EUS_Split Charging Traffic<br>EUS_Universal Access Number Traffic<br>EUS_zonal non local traffic<br>NLS4_1_EAA interconnection - Fixed to BGC<br>NLS4_1_EAA interconnection - Mobile to BGC<br>NLS4_1_IAA interconnection - BGC to Fixed<br>NLS4_1_IAA interconnection - Fixed to BGC<br>NLS4_1_Incoming International Traffic<br>NLS4_1_INTERNET TRAFFIC<br>NLS4_1_interzonal A traffic<br>NLS4_1_interzonal B traffic<br>NLS4_1_Outgoing International Traffic<br>NLS4_1_Transit International (M)OLO Traffic EAA |
| **VoiceCallHandling** | EUS_Carrier PreSelection IAA interconnection<br>EUS_Carrier PreSelection local interconnection<br>EUS_Consultel 090x Traffic<br>EUS_DCIA traffic<br>EUS_EAA interconnection - BGC to Fixed<br>EUS_EAA interconnection - BGC to Mobile<br>EUS_Freephone Traffic<br>EUS_IAA interconnection - Mobile to BGC<br>EUS_IAA interconnection - BGC to Mobile<br>EUS_interzonal traffic<br>EUS_Local interconnection - OLO to BGC<br>EUS_local traffic<br>EUS_National Transit (M)OLO traffic EAA interconnection<br>EUS_National Transit (M)OLO traffic IAA interconnection<br>EUS_Split Charging Traffic<br>EUS_Universal Access Number Traffic<br>EUS_zonal non local traffic<br>NLS4_1_EAA interconnection - Fixed to BGC<br>NLS4_1_EAA interconnection - Mobile to BGC<br>NLS4_1_IAA interconnection - BGC to Fixed |

NLS4_1_IAA interconnection - Fixed to BGC
NLS4_1_Incoming International Traffic
NLS4_1_INTERNET TRAFFIC
NLS4_1_Outgoing International Traffic
NLS4_1_Transit International (M)OLO Traffic EAA
NLS4_1_Transit International (M)OLO Traffic IAA

### 7.9.3 Contributors to the application services

Voice application services in the access

PSTN and ISDN access services are the result of the voice concentrator function in the closest technical building (local switch or remote unit) and the physical copper connectivity between the customer site and the technical building. In addition, the data connectivity required to transport Voice over IP signaling and traffic to the Voice over IP switching units is also included as a contributor to voice access.

PRA access services do not need a concentrator function (that function is typically realized within the customer site by private switches) but merely a voice transport link to the local switch. This one obtained directly from layer 2.0 transport segments and local tails.

Hereunder a summary of the contributors to voice access together with the drivers used to determine their level of involvement in the service:

| Voice access service | Contributor | Driver Name |
|---|---|---|
| **NLS4_0_ISDN_access** | **NLS1_0_Continue_Raw_Copper** | Nbr_of_used_pairs |
| | **NLS1_0_Raw_Copper** | Nbr_of_used_pairs |
| | **NSF_ISDN_NetworkTermination** | Nbr_of_accesses |
| | **NSF_ISDN_Voice_concentrator** | Nbr_lines_inUse |
| **NLS4_0_PSTN_access** | **NLS1_0_Continue_Raw_Copper** | Nbr_of_used_pairs |
| | **NLS1_0_Raw_Copper** | Nbr_of_used_pairs |
| | **NLS3_VoIP_IP_collection** | Direct |
| | **NSF_PairGainSystem** | Direct |
| | **NSF_PSTN_Voice_concentrator** | Nbr_lines_inUse |
| **NLS4_0_ISDN-PRA_access** | **NLS2_0_InterCityBackboneCapacity=2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_IntraAreaBackboneCapacity=2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_IntrazonalBackboneCapacity=2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_LocalBackboneCapacity=2M** | Bandwidth consumed (Mbit/s) |
| | **NLS2_0_LocalTailCapacity** | Bandwidth consumed (Mbit/s) |
| | **NSF_ISDN_Primary_Access** | Nbr_lines_inUse |

Voice application services in the backbone (see picture Figure 20 - Switching Network)

The services in the group "Access to VoiceCallHandling" allow to access the switching matrix and call handling , they are realized by ports to the switch (a switch port concentrates the voice circuits from/to the switching matrix). The switching ports (trunks) can be those of a local switch or of a transit switch .

For the case of interconnection with other operators (NLS4_0_Voice_traffic_AreaLevel_PointOfInterconnect, NLS4_0_Voice_traffic_Local_PointOfInterconnect) , the charging function of the switch is also exercised in order to allow for interoperator billing.

In summary the contributors are distributed using following drivers:

| Network functions used to realize Access to VoiceCallHandling services | Driver used to attribute network functions to access to VoiceCallHandling services |
|---|---|
| **NSF_Voice_call_CAE_charging** | RoutedMin |
| **NSF_Voice_call_CAE_Trunks** | TimeSlot_capacity_used |
| **NSF_Voice_call_Local_charging** | RoutedMin |
| **NSF_Voice_call_Local_Trunks** | TimeSlot_capacity_used |

The services in the group "VoiceCallHandling" result from three network stage functions:
NSF_Voice_call_CAE_Processing
NSF_Voice_call_Local_Processing
NSF_Voice_call_Local_charging

The driver used is "routed minutes" and it consists in determining the average nbr of times (=routing factor) a voice call handling type is using the network functions . The routed minutes result from multiplication of the routing factor with the amount of calls (expressed in minutes) exercising that voice call handling type.

| Network function | | Driver Name |
|---|---|---|
| **NSF_Voice_call_CAE_Processing** | NLS4_0_Voice_traffic_AreaLevel_Collect | RoutedMin |
| | NLS4_0_Voice_traffic_AreaLevel_Complete | RoutedMin |
| | NLS4_0_Voice_traffic_AreaLevel_Terminate | RoutedMin |
| | NLS4_0_Voice_traffic_AreaLevel_Transit | RoutedMin |
| **NSF_Voice_call_Local_charging** | NLS4_0_Voice_traffic_Local_Collect | RoutedMin |
| | NLS4_0_Voice_traffic_Local_Complete | RoutedMin |
| **NSF_Voice_call_Local_Processing** | NLS4_0_Voice_traffic_Local_Collect | RoutedMin |
| | NLS4_0_Voice_traffic_Local_Complete | RoutedMin |
| | NLS4_0_Voice_traffic_Local_Terminate | RoutedMin |

The services in the group "Voice transport" are emanating from layer 2.0 Backbone transport capacity (<2M) which are distributed according to the consumed bandwidth.

The services in the group "VAS application" are in fact directly identified with a network function:

| | | |
|---|---|---|
| **NSF_Advanced_Number_Translation_CallHandling** | NLS4_0_Advanced_Number_Translation_CallHandling | direct |
| **NSF_CallerIdentity_CallHandling** | NLS4_0_CallerIdentity_CallHandling | direct |
| **NSF_CallingCard_CallHandling** | NLS4_0_CallingCard_CallHandling | direct |
| **NSF_InteractiveVoiceResponse_CallHandling** | NLS4_0_InteractiveVoiceResponse_CallHandling | direct |
| **NSF_MessageWaitingIndicator_Inserting** | NLS4_0_MessageWaitingIndicator_Inserting | direct |
| **NSF_OtherAdvanced_CallHandling** | NLS4_0_OtherAdvanced_CallHandling | direct |
| **NSF_PrepaidCallingCard_CallHandling** | NLS4_0_PrepaidCallingCard_CallHandling | direct |
| **NSF_Service_Announcements_Playing** | NLS4_0_Service_Announcements_Playing | direct |
| **NSF_Televoting_CallHandling** | NLS4_0_Televoting_CallHandling | direct |
| **NSF_VirtualPrivateNetwork_CallHandling** | NLS4_0_VirtualPrivateNetwork_CallHandling | direct |
| **NSF_VoiceFeatures_SelfManaging** | NLS4_0_VoiceFeatures_SelfManaging | direct |
| **NSF_Voicemail&Messaging** | NLS4_0_Voicemail&Messaging | direct |
| **NSF_WakeUp_CallHandling** | NLS4_0_WakeUp_CallHandling | direct |

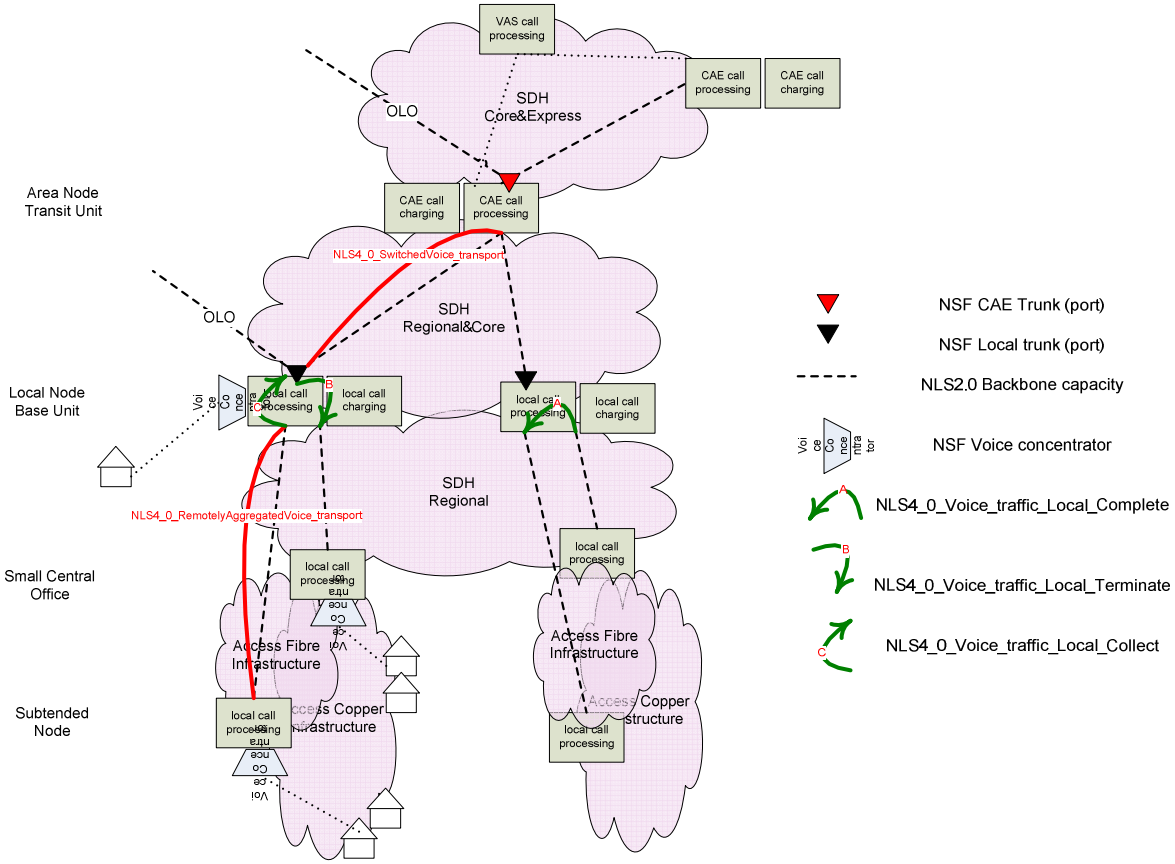



**Figure 20 - Switching Network**

## 7.10 Allocation of Network Activities

| Activity | Division | Team Group | Driver |
|---|---|---|---|
| [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] | [50_SDE] | SDV-NIE-CAT | Mandays |
| [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] | [50_SDE] | SDV-NIE-CPE | Mandays |
| [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] | [50_SDE] | SDV-NIE-DOT | Mandays |
| [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] | [50_SDE] | SDV-NIE-LAB | Mandays |
| [5.1.1. NW Infrastructure Engineering (SDV-NIE-xxx)] | [50_SDE] | SDV-NIE-PLE | Mandays |
| [5.1.2. NW Product & Service Engineering (SDV-PSE-xxx)] | [50_SDE] | SDV-PSE-DAC | Mandays |
| [5.1.2. NW Product & Service Engineering (SDV-PSE-xxx)] | [50_SDE] | SDV-PSE-VID | Mandays |
| [5.1.2. NW Product & Service Engineering (SDV-PSE-xxx)] | [50_SDE] | SDV-PSE-VNC | Mandays |
| [5.2.1. NW Plan Backbone Inside plant works and document (IDO-FXx-BND-EQE)] | [50_SDE] | IDO-FXx-BND-EQE | # Equivalent FTE |
| [5.2.10. NW (Supervision, coordination and inventory) Outside construction (IDO-FXx-LPE-xxx)] | [50_SDE] | IDO-FXx-LPE-xxx | # Equivalent FTE |
| [5.2.11. NW Access Outside Video event (IDO-FXx-OPT-Radio)] | [50_SDE] | IDO-FXx-OPT-Radio | # Equivalent FTE |
| [5.2.12. NW Access Outside VHR for customer (IDO-FXx-OPT-VHR)] | [50_SDE] | IDO-FXx-OPT-VHR | # Equivalent FTE |

| | | | |
|---|---|---|---|
| [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] | [50_SDE] | COP-CFO1-CAB | Cable provisioning DUs |
| [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] | [50_SDE] | COP-CFO2-CAB | Cable provisioning DUs |
| [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] | [50_SDE] | COP-CFO3-CAB | Cable provisioning DUs |
| [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] | [50_SDE] | COP-CFO4-CAB | Cable provisioning DUs |
| [5.2.13. NW Access Outside - copper work for customer (COP-CFO-Cable)] | [50_SDE] | COP-CFO5-CAB | Cable provisioning DUs |
| [5.2.2. NW Plan Access Inside plant works and document (IDO-FXx-BND-EQE)] | [50_SDE] | IDO-FXx-BND-EQE | # Equivalent FTE |
| [5.2.3. NW Backbone Inside Installation (HW or SW) (IDO-FXx-IMR-xxx)] | [50_SDE] | IDO-FXx-IMR-xxx | # Equivalent FTE |
| [5.2.5. NW Infrastructure Remote Configuration (SIO-INO-TIO)] | [50_SDE] | SIO-INO-TIO | # Equivalent FTE |
| [5.2.6. NW Voice Service Remote Configuration (SIO-INO-VSP)] | [50_SDE] | SIO-INO-VSP | # Equivalent FTE |
| [5.2.7. NW Data&TV&CDR Service Remote Configuration (SIO-INO-DSP)] | [50_SDE] | SIO-INO-DSP | # Equivalent FTE |
| [5.2.8. NW Plan outside plant works and document (IDO-FXx-BND-IDE)] | [50_SDE] | IDO-FXx-BND-IDE | # Equivalent FTE |
| [5.2.9. NW Plan outside plant works, Solution design & Engineering for VHR/Industrial zonings (IDO-FXx-BND-IDE-VHR)] | [50_SDE] | IDO-FX3-BND-IDE-VHR | # Equivalent FTE |

| | | | |
|---|---|---|---|
| [5.3.1. NW Backbone Inside Maintenance & Repair (IDO-FXx-IMR-xxx)] | [50_SDE] | IDO-FXx-IMR-xxx | # Equivalent FTE |
| [5.3.10. NW Infrastructure Maintenance and Remote Repair 3rd line (SIO-INO-TIO)] | [50_SDE] | SIO-INO-TIO | # Equivalent FTE |
| [5.3.11. NW Infrastructure Monitoring (SIO-CSC-NOC excl. ITMON)] | [50_SDE] | SIO-CSC-NOC_NW | # Equivalent FTE |
| [5.3.2. NW Access Inside Maintenance & Repair (IDO-FXx-IMR-xxx)] | [50_SDE] | IDO-FXx-IMR-xxx | # Equivalent FTE |
| [5.3.3. NW (Supervision, coordination and inventory) Outside Maintenance & Repair (IDO-FXx-LPE-xxx)] | [50_SDE] | IDO-FXx-LPE-xxx | # Equivalent FTE |
| [5.3.4. NW Access Outside Maintenance & Repair FO, ROP (IDO-FXx-OPT-OUT)] | [50_SDE] | IDO-FXx-OPT-OUT | # Equivalent FTE |
| [5.3.5. NW Access Outside Maintenance & Repair VHR,Radio (IDO-FXx-OPT-VHR, IFO-FXx-OPT-Radio)] | [50_SDE] | IDO-FXx-OPT-Radio | # Equivalent FTE |
| [5.3.5. NW Access Outside Maintenance & Repair VHR,Radio (IDO-FXx-OPT-VHR, IFO-FXx-OPT-Radio)] | [50_SDE] | IDO-FXx-OPT-VHR | # Equivalent FTE |
| [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] | [50_SDE] | COP-CFO1-CAB | Cable repair DUs |
| [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] | [50_SDE] | COP-CFO2-CAB | Cable repair DUs |
| [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] | [50_SDE] | COP-CFO3-CAB | Cable repair DUs |

| | | | |
|---|---|---|---|
| [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] | [50_SDE] | COP-CFO4-CAB | Cable repair DUs |
| [5.3.6. NW Access Outside Maintenance & Repair Cable (COP-CFO-Cable)] | [50_SDE] | COP-CFO5-CAB | Cable repair DUs |
| [5.3.7. NW Customer Service Fault Handling & Remote Repair 2nd line (SIO-CSC-SSD)] | [50_SDE] | SIO-CSC-SSD | # Equivalent FTE |
| [5.3.8. NW Voice service level Maintenance & Remote Repair 3rd line (SIO-INO-VSP)] | [50_SDE] | SIO-INO-VSP | # Equivalent FTE |
| [5.3.9. NW Data&TV&CDR service level Maintenance & Remote Repair 3rd line (SIO-INO-DSP)] | [50_SDE] | SIO-INO-DSP | # Equivalent FTE |

Cost of NW activities is allocated to NW objects (NE, NSF, CP, NLS) on which teamgroups have worked via assigned NW activity.

- The driver quantity used for SDE SDV teamgroup&activity is Mandays registered in RAPID.
- The driver quantity used for COP CFO CABLE teamgroup&activity is Cable related DUs registered in CLARA.
- The driver quantity used for SDE SIO teamgroup&activity is Equivalent FTEs reported from ABB.
- The driver quantity used for SDE IDO teamgroup&activity is Equivalent FTEs reported from LEAD, JMS and CANVAS.

Allocation is processed in "Network Primary Activities (Process 5)" box (ref to Figure 2: Graphic representation of the Belgacom Regulatory Cost Model 2009) and ending in cost object of module "Network" of REG Cost Model.

# 8 Annex I: ABC Flow Acronyms

| | |
|---|---|
| ABC | Activity Based Costing |
| BIPT | Belgian Institute for Postal services and Telecommunications |
| BTN | Business TransformatioN |
| CBU | Consumer Business Unit |
| CC | Costs Center |
| CCG | Costs Center Group |
| CFO | Customer Field Operations |
| COGS | Costs Of Good Sold |
| COP | Customer Operations |
| CP | Costs Pool |
| CWS | Carrier & WholeSale |
| EBU | Enterprise Business Unit |
| FAC | Fully Allocated Costs |
| HCA | Historical Cost Accounting |
| IDO | Infrastructure, Deployment & field Operations |
| MOS | Material Out of Stock |
| NRA | National Regulatory Authority |
| REG | (Belgacom) Group Regulatory Affairs |
| SDE | Service Delivery Engine |
| SDV | Service Development |
| SIO | Service center & remote Infrastructure Operations |
| SMP | Significant Market Power |
| SOG | Services & Other Goods |
| S&S | Staff & Support |

# 9 Annex II: Network and IT Flows Acronyms

| | |
|---|---|
| AC | Asset Class |
| ADSL | Asymmetric Digital Subscriber Line |
| ATM | Asynchronous Transfer Mode |
| BA | Basic Access |
| BAS | Broadband Access Server |
| BES | Belgacom European Solutions |
| BGC | Belgacom |
| BILAN | Belgacom Interconnection of LANs |
| BLES | Belgacom LAN Extension Service |
| BROBA | Belgacom Reference Offer for Bitstream Access |
| BROTSOLL | Belgacom Reference Offer for Terminating Segment of Leased Line |
| BVAS | Business Value Added Services |
| CAE | Coverage Exchange Area |
| CAPEX | CApital Expenditures |
| CP | Cost Pool |
| CPE | Customer Premises Equipment |
| CPU | Central Processing Unit |
| CWDM | Coarse Wavelength Division Multiplexing |
| DACS | Digital Analog Cross-connect System |
| DCN | Data Communication Network |
| DSL | Digital Subscriber Line |
| DSLAM | Digital Subscriber Line Access Multiplexer |
| DWDM | Dense Wavelength Division Multiplexing |
| EAA | Extra Access Area |
| EAL | Ethernet Access Line |
| EFM | Ethernet First Mile |
| ESS | Ethernet Service Switch |
| Ethane | ETHernet Aggregation NETwork |
| EUS | End User Service |
| FAC | Fully Allocated Costs |

| | |
|---|---|
| FIFA | Fast Internet Future Architecture |
| FTTC | Fiber To The Cabinet |
| FTTO | Fiber To The Office |
| Gb | Giga bit |
| Gbps | Giga bits per second |
| HW | HardWare |
| IAA | Intra Access Area |
| iDTV | interactive Digital TeleVision |
| IN | Intelligent Network |
| INCA | Integrated Cost Application |
| IO | In/Out |
| IP | Internet Protocol |
| IPVPN | Internet Protocol Virtual Private Network |
| ISAM | IP Subscriber Line Access Multiplexer |
| ISDN | Integrated Services Digital Network |
| LAN | Local Area Network |
| LDC | Local Distribution Center |
| LEX | Local Exchange |
| LL | Leased Line |
| LTE | Line Terminating Equipment |
| Mbit | Mega bit |
| MOLO | Mobile Other Licensed Operator |
| MPLS | MultiProtocol Label Switching |
| MSR | Multi Server Router |
| MUX | Multiplexer |
| MVAS | Mass Value Added Services |
| MWE | MicroWave Equipment |
| NE | Network Element |
| NGA | New Generation Access |
| NGN | New Generation Network |
| NLS | Network Layer Service |
| NTE | Network Terminating Equipment |
| NTP | Network Termination Point |
| NSF | Network Stage Function |

| | |
|---|---|
| OLO | Other Licensed Operator |
| OLTE | Optical Line Terminating Equipment |
| OPEX | OPerational Expenditure |
| OVH | Overhead |
| PDH | Plesiochronous Digital Hierarchy |
| PRA | Primary Access |
| PSTN | Public Switched Telephony Network |
| QoS | Quality of Service |
| RAM | Random Access Memory |
| ROP | Remote Optical Platform |
| SDH | Synchronous Digital Hierarchy |
| SDSL | Symmetric Digital Subscriber Line |
| STM | Synchronous Transport Module |
| TDM | Time Division Multiplexing |
| TV | TeleVision |
| VAS | Value Added Services |
| VDSL | Very high speed Digital Subscriber Line |
| VLAN | Virtual Local Area Network |
| VoD | Video on Demand |
| VoIP | Voice over Internet Protocol |
| VP | Virtual Path |
| VPLS | Virtual Private Local area network Service |
| VPN | Virtual Private Network |
| WDM | Wavelength Division Multiplexing |