

Annex to the BEREC Report Next Generation Access – Implementation Issues and Wholesale Products

This document constitutes an annex to the BEREC Report Next Generation Access - Implementation Issues and Wholesale Products. It provides practical experiences with various wholesale products in different countries.

Considering that some countries have enforced national laws allowing for symmetric regulation independent of dominance according to the Art. 7 procedures this document also provides examples where regulation of wholesale products is based on such specific national laws.

Annex: Practical Experiences

Content

A.1	Access to inhouse wiring or equivalent	1
A.1.1	Croatia	1
A.1.2	Norway	1
A.1.3	Portugal	2
A.2	Concentration point unbundling	2
A.2.1	France	2
A.2.2	Spain	5
A.2.3	Switzerland	7
A.3	Cabinet unbundling	11
A.3.1	Croatia	11
A.3.2	Denmark	12
A.3.3	Germany	12
A.3.4	The Netherlands	14
A.3.5	Norway	15
A.4	Fibre unbundling	15
A.4.1	Croatia	15
A.4.2	The Netherlands	16
A.5	Enhanced bitstream products currently available	18
A.5.1	Belgium (VDSL)	18
A.5.2	Croatia	19
A.5.3	Denmark (VDSL)	20
A.5.4	Italy (ADSL2+, SHDSL, GBE/Fibre, ATM, multicast)	21
A.5.5	The Netherlands (VDSL, Ethernet/Fibre)	23
A.5.6	UK	24
A.6	Duct Access currently available	27
A.6.1	Austria	27
A.6.2	Croatia	28
A.6.3	Denmark	30
A.6.4	France	31

A.6.5 Germany	34
A.6.6 Lithuania	35
A.6.7 Norway	37
A.6.8 Portugal	37
A.6.9 Spain	39
A.6.10Switzerland	43
A.7 Access to Dark Fibre	45
A.7.1 Croatia	45
A.7.2 Germany	45
A.7.3 Norway	45

A.1 Access to inhouse wiring or equivalent

A.1.1 Croatia

An Ordinance on technical conditions of electronic communications network for business and residential buildings that was adopted in December 2009 defines technical conditions for planning, architectural design, building, reconstruction, upgrading, use and maintenance of electronic communications network of business and residential buildings with related electronic communications infrastructure and associated facilities (ECNI) as well as cable infrastructure for access to ducts of the buildings. Built ECNI must enable all owners of the building to freely choose between the operators, and the operators to access the building under equal and non-discriminatory conditions.

Installations in buildings must be planned and built in such a way to enable broadband access services. The investor that is owner/co-owner is obliged to maintain and to reconstruct installation in accordance with the general purpose of the building. Depending on the access network, the installation can be fiber optic or wire. Electronic communications network of the building must support generic cabling, must be implemented in conformity with the standards (European, international and Croatian) and certain parts must be implemented as obligatory while some parts can be optional. Electronic communications network of the building includes three types of installation for ICT, BCT and CCCB applications. For ICT applications that are implemented as fiber optic installation, it is necessary to ensure 4 fibers to each apartment.

Access and use of installation for the purpose of service provision will be free of charge for the operator, but the access must be enabled under equal conditions. To build new fiber optic installation, the operator can invest as well but it must agree a relation with the owners in such a way to enable other operators to access the installations.

A.1.2 Norway

In NPT's decision for market 4, remedies only apply if the in-house wiring is copper owned by the SMP-operator. The market definition in itself is technology-neutral, but the remedies in the current decision mainly apply in relation to the SMP-operator's copper access network (except the obligation of access to ducts, which is not linked to any specific access technology).

However, there is national legislation in Norway facilitating access to privately owned networks in e.g. housing co-operatives, industrial parks, neighbourhoods, etc., which apply to in-house wiring irrespective of access technology.

A.1.3 Portugal

A Decree-Law, published in May of 2009, included the definition of the framework that applies to the development of and investment in NGA, including the provision for technical standards on infrastructures for telecommunications aimed at eliminating or reducing vertical barriers to the roll out of fibre optics and to prevent the first operator from monopolizing the access to buildings.

The compulsory set up of fibre optics in the scope of the infrastructures for telecommunications in buildings (ITED) has been laid down, in addition to that of copper and coaxial cable, which has been compulsory so far. Rules have been laid down to avoid monopolization of ITED infrastructures by the first operator, by imposing sharing of the new (or upgraded) infrastructure within the building.

The first operator to reach a (already built¹) building has to install at least two fibres per home (apartment) and associated infra-structure to be shared by other operators (e.g. vertical infra-structure and ODF).

The second operator reaching the building will pay 50% of the costs incurred in the installation of the shared infra-structure². The third operator will pay 33% and so on.

A.2 Concentration point unbundling

A.2.1 France

The treatment of access to in-house wiring in France rests on two pillars: the “Law on the Modernisation of the Economy” (“Loi de Modernisation de l’Economie, LME”) and a draft measure – consisting of a draft regulatory decision and a recommendation

The “Law on the Modernisation of the Economy” (“Loi de Modernisation de l’Economie, LME”) foresees an the obligation to share in-building fibre wiring at reasonable, transparent and non-discriminatory economical and technical conditions, at a local connection point (“point de mutualisation”) located outside the private property, unless decided otherwise by the NRA. It applies symmetrically to all operators.

The draft measure sets out the terms and conditions for access to fibre optic electronic communication lines and defines the cases where the local interconnection point can be located on private property.

¹ For new buildings, the same rule applies, but the responsible for the installation of infra-structure and cabling is the owner.

² This 50% will be paid to he first operator.

Legal basis of the draft measure

Article L. 34-8-3 of CPCE (French telecoms law) resulting from the relevant specifications in the LME pursuant to Article 12 of the Framework Directive, foresees a right for undertakings providing electronic communications services to have access to the fibre line deployed inside a building to connect end-users. In order to implement such symmetrical access regulation, ARCEP has adopted complementary obligations on the basis of Art L.34-8 of CPCE transposing Article 5 of the Access Directive. Therefore, ARCEP notifies its draft measure on the basis of Article 5 of the Access Directive, as a necessary complement to the co-location and facility sharing arrangements imposed pursuant Article 12 of the Framework Directive.

Scope and content of the draft measure

The draft decision imposing access conditions on in-building operators³ applies not only to electronic communications operators but also to any undertaking having established or operating an in-building optical fibre line, since they control access to the end-users.

ARCEP distinguishes between "very dense areas" and the rest of the French territory. "Very dense areas" are defined as municipalities where, on a large part of the relevant territory, infrastructure competition is susceptible to emerge, i.e. where it is economically viable for several operators to rollout their own fibre access network in the proximity of dwellings

ARCEP defines these areas in three steps: First it retains urban units (in the sense of the French National Institute for Statistics and Economic Studies, INSEE) in metropolitan France with over 250 000 inhabitants. Second, from this group it retains only those units in which at least 20% of buildings have more than 12 dwellings. Third it selects within these units, only central municipalities and peripheral municipalities in which at least 50% of buildings count more than 12 dwellings or for which fibre rollout projects have been announced. This selection procedure results in a list of 148 communes (listed in annex I of the notified draft decision) corresponding to 5.54 million dwellings, 3.5 million of which are located in large buildings or are accessible via sewage networks.

The draft measure distinguishes between access obligations applicable on the whole French territory and those applicable only in "very dense areas":

Access obligation applicable on the whole French territory

The in-building operator should meet reasonable requests for passive access to its fibre lines at a local connection point - normally located outside the limits of the private property⁴ - and to the required associated facilities at reasonable and non-discriminatory conditions. It may, either before or after rolling-out its fibre lines into the building, upon reasonable request give

³ The undertaking which has laid or foresees to rollout fibre lines inside a building.

⁴ In the case where at least four fibre lines are installed per dwelling and all four lines are activated by operators, the building's operator may propose (passive or active) access at a point higher up in the network than the local connection point.

access to a dedicated fibre line (for permanent access to the building's dwellings) or to a shared fibre line (for temporary access to the building's dwellings, in accordance with the subscriptions of the end-users)

Where an operator has obtained the authorization to equip a building with optical fibre, all other operators must be informed of all necessary details regarding the relevant building within one month after the conclusion of the convention with the building owner and three months prior to the activation of the local connection point.

Access obligation applicable only in "very dense areas":

In the "very dense areas", the operator equipping a building is obliged, upon reasonable request, and provided the request is formulated prior to the rollout of the fibre lines, to (i) install an additional fibre to each building dwelling if the requesting operator is willing to participate ab initio to the total installation cost and (ii) to guarantee the installation of a distribution panel inside or in the proximity of the local connection point. According to ARCEP, these provisions allow operators to choose either a point-to-multipoint (PON) or a point-to-point (P2P) network architecture (technology neutrality).

Access terms and conditions

Access pricing conditions must follow the principles of non-discrimination, objectivity, pertinence⁵ and efficiency of investment⁶.

ARCEP considers that in those cases where commercial operators request the installation of additional fibre lines prior to the rollout of fibre into the building, the host operator may require a financial participation ab initio. In this regard, ARCEP distinguishes between (i) the equitable costs to be shared by all operators, i.e. the infrastructure costs used by all connected operators including, where appropriate, the costs engaged to provide access to operators arriving later on the market, and (ii) the individual costs pertaining only to a given connected operator, i.e. the infrastructure costs derived from their deployment modalities and choices, which are to be established in line with the above mentioned principles.

Instead, where operators connect to the fibre network local connection point after the rollout of the in-building wiring, ARCEP foresees that the tariff charged contains a rate of return on capital that takes account of the initial investment risk and attributes a premium to the hosting operator.

ARCEP stipulates that access to fibre lines should be provided under transparent conditions. To this end, operators rolling-out fibre into the building are required to publish, within one month from adoption of the present draft decision, an access offer containing the conditions

⁵ Costs incurred by the operator requesting or using the corresponding infrastructure or services must be supported by that operator.

⁶ The costs charged to the commercial operator must correspond to the costs incurred by an efficient operator, i.e. excluding undue or excessive costs

for the installation of a dedicated fibre or of a distribution panel, for the access to dedicated or shared fibre lines and for access to associated resources. Furthermore, the host operator is subjected to a cost accounting obligation.

A.2.2 Spain

Symmetrical measures were imposed February 2009 by CMT, aimed to promote and facilitate sharing of fibre deployments within and near buildings, valid for buildings without Common Telecommunications Infrastructures (those built before 1998).

These measures establish that operators that deploy in-building fibre wirings shall meet all reasonable access requests, and are obliged to agree with third parties procedures, technical constrains, prices and timings with regards to the provision of access to the fibre facilities installed. Such wholesale agreements must foresee the establishment of technical implementations so that other operators can share fibre resources under reasonable conditions in terms or costs and prices. In addition, to avoid that third operators encounter entry barriers such as property access negatives or lack of space for additional fibre deployments, the first operator in deploying fibre within buildings must play the role of manager of the network resources installed. Thus, the first operator is obliged to carry out the tasks required to effectively complete the facilities sharing, such as cabling and installation of the referred facilities for third operators.

Furthermore, the obligation to facilitate access to the facilities installed in buildings under reasonable costs is imposed, thus guaranteeing that costs do not constitute an entry barrier to third parties.

Finally, as transparency obligations are essential in order to permit that third operators are in a position to efficiently arrange and generate access requirements, CMT has estimated that a number of information fields are indispensable for that purpose, such as passed buildings, details about the variety of deployment performed and technical data with regards to distribution boxes and fibre.

Scope of the obligations

The obligations are directed exclusively to operators who deploy or have deployed networks based on fibre optics and other related facilities within the buildings. Not included are other operators whose deployment strategies involve the location in the buildings of network resources other than optical.

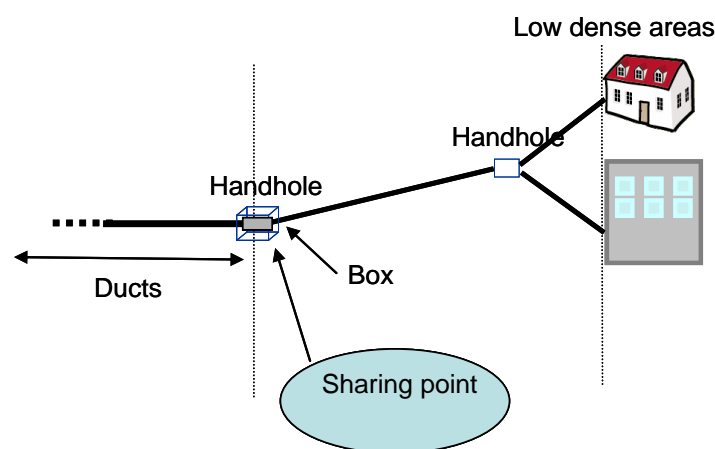
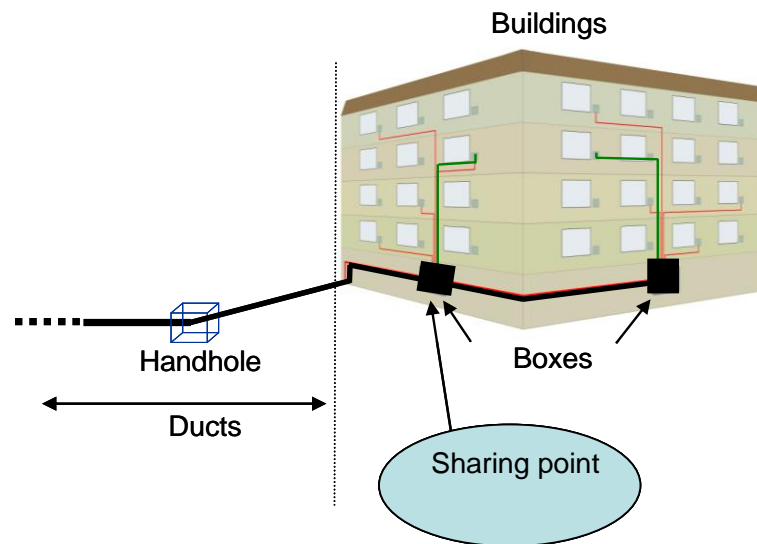
The measure is only applicable to buildings not equipped with Common Telecommunications Infrastructures.

Excluded from the application of the obligation of sharing are buildings devoted entirely to conducting business activities.

Sharing point

The point of sharing corresponds to the location of the optical termination boxes of the first operator to deploy optical fibre.

The resources to be shared are those deployed between that point and end-user home. The optical termination box may be placed in the building itself or in the public domain, according to criteria of efficiency of the first operator



Remedies imposed

A particular technical solution for the sharing of elements is not imposed, as there is not a single optimum scenario, technological neutrality must be preserved and the mentioned elements are subject to rapid evolution.

The first operator to deploy optical fibre in a building must agree procedures, technical conditions, prices and timing with other operators. They have four months to reach an agreement since start of the negotiations. The adopted technical solutions must be deployable in reasonable conditions (timing and prices). The responsibility of handling all tasks related to the

sharing of the resources (like laying new cables) is on the “building operator”, which is the first operator that has deployed fibre in that building.

The offered prices cannot be excessive and cannot represent a barrier to entry. They must allow the first operator to recover the incremental costs associated with the sharing.

The first operator to deploy fibre in a building must provide third parties with information needed to plan their access requests, such as buildings where optical cabling has been laid, type of deployment, characteristics of the optical termination boxes and of the vertical cabling, available space in vertical ducts for additional fibres, etc..

A.2.3 Switzerland

1. Models for deployment of multifibre networks

Current regulation

The Swiss telecommunications market is regulated by the Telecommunications Act⁷ and its ordinances. Currently, products based on optical fibre access networks are excluded from regulation by law. This provision applies to market 4 as well as market 5. Duct access is regulated based on an SMP finding in the market for Swisscom ducts (see A.6.7). There are no symmetric measures in place for the terminating FttH segment at this moment.

Activities of the regulator

Even if there is no regulation of products based on optical fibre access networks foreseen, the Swiss regulator (ComCom) voluntarily acts as a mediator between the operators in order to promote the construction of such networks. In autumn 2008, ComCom invited the main actors such as telecommunications service providers, utilities and cable network operators, for a round table. The discussion aimed to coordinate at high level the development of the networks. Three further round tables have been held since. The actors have agreed on several points: to avoid parallel networks, to coordinate the various construction projects between the utilities and Swisscom, to connect buildings and homes with multifibre cables and to provide open access without discrimination to the FttH network at both passive and active levels (layers 1 and 2). The round table also started standardisation activities in the areas of 1) the in-house installation and 2) active line access. Another important point of discussion concerns contracts between the owners of buildings and the network operators. The round table process will be carried on with a fifth meeting on 4. February 2010 which will focus on the cooperation models between Swisscom and the utilities.

⁷ <http://www.admin.ch/ch/e/rs/7/784.10.en.pdf>

State of the discussion on NGA regulatory strategy

BAKOM is preparing a report to evaluate the development of the telecommunications market and the efficiency of existing regulations for the Government. Part of this report will concern fibre to the home (FttH) deployment and support the political discussions on if and how fibre networks should be regulated. Several external studies will evaluate regulatory options in view of NGA as well as the business case for NGA in Switzerland. BAKOM's report as well as the supporting studies are likely to be published in the second or third quarter of 2010. The publication of the report will be subject to Government approval.

Market development - VDSL

The Swiss incumbent Swisscom has already invested in fibre to the cabinet (FttCab) for many years, achieving a 75% coverage of the connected population using VDSL technology by the end of 2008. Subloop unbundling is subject to regulation in Switzerland. However, subloop unbundling is to date not observed in the market and no legal challenges have been submitted to ComCom.

Market development - FttH

Following the VDSL roll-out Swisscom had no immediate plan to invest in FttH networks. However, following public votes and announcements of plans by local utilities of various cities – like Zurich, Geneva, Basel, St-Gall, Berne, Lausanne, Lucerne and other smaller ones – to deploy regional FttH networks Swisscom decided it could not afford to be left behind. Such a decision might also have been influenced by CATV (Docsis 3.0) competition. A certain competition for building up the FttH access network in an area is therefore developing in some urban regions.

According to Swisscom's roll-out plans, the 20 biggest cities and their respective areas in Switzerland should be connected by FttH by 2015, amounting to 34% of connected households. In 2020, this figure should reach 50%. Swisscom plans to invest about 270 million € per year until 2015.

Cooperation models

Reacting to the various initiatives launched by the utilities, Swisscom suggested cooperation models for construction and investment, including renting / purchase models for fibres by interested actors. Each model implies multifibre deployment.

1) Co-Construction

The co-construction model implies that building activities are separated in precise areas and that the different actors would then exchange their respective fibres through long-term IRUs⁸.

⁸ Indefeasible Rights of Use

2) Co-Investment

The co-investment model implies the participation of only one actor in building activities. The other operator only participates in terms of financing support and receives exclusive rights for the use of fibre to each household.

Layer 1 Access in Multifiber

Access to the fibres would generally be granted at the concentration point (manhole or higher in the network according to agreement). Moreover, access would be offered at Layer 1, where a spare fibre (usually fully spliced up to the home) would be connected (spliced) to a backhaul fibre of the partner.

The Swisscom model foresees four fibres to each customer in the drop segment, but in the initial installation only two of them would be fully spliced and terminated in connectors in the living room (fibres fully spliced up to the home). Further more, the two fibres would be connected to feeder fibres (usually at the manhole).

In order for a customer to use a third infrastructure provider additional splicing may be required in the basement and/or in the manhole. Also, an additional connector may have to be installed at the optical telecommunications outlet in the living room. Alternatively an already existing infrastructure provider could “sell” or “rent” his fully spliced optical fiber similarly to traditional unbundling.

Therefore, different cooperation solutions are developing in Switzerland (see also 2.). Not all local utilities have however the same strategy. Currently some utilities want to limit themselves to offer only active products (layer 2 or layer 3), others would also offer Layer 1 access to alternative operators. There are also utilities not opting for the multifiber model and deploying only single fibre with (usually) a non-discriminatory Layer 2 access for all alternative providers including Swisscom (for example EW Obwalden, which is not participating at the round table).

2. Specific cases of deployment

Preliminary, publicly available information on FTTH deployment in Switzerland suggest the following situation (break down per region):

Zürich: EWZ (“Elektrizitätswerk der Stadt Zürich”)

In March 2007, the population of Zürich voted a credit of 200 million Swiss francs until 2013, in order to deploy an optical fibre network in the city. Along with CATV competition, this vote was one of the elements explaining the strategy change of Swisscom. It subsequently decided to invest in optical fibre networks in Swiss cities, above all in cities where it was decided to deploy ‘open access’ networks (Zürich, Basel, Bern, St-Gall, Geneva, Lausanne and Fribourg). In Zurich both Swisscom and EWZ build their respective networks. Swisscom develops a 4-fibre model. EWZ has chosen to deploy 4 fibres in each building, but only one to

the building. The negotiations between them are not finished yet, therefore no agreement is found regarding cooperation. Today, about 18'000 retail customers could use services on EWZ's broadband network. EWZ does, however, not aim for a 100% coverage in Zürich. According to its plan, 20% of households and companies could be connected to its infrastructure at the end.

Bern: EWB ("Energie Wasser Bern")

In December 2009, EWB and Swisscom came to agreement regarding the construction of multifibre networks in the city of Bern. EWB is in charge of the construction. They would jointly invest about 140 million Swiss francs. The total amount of investments is distributed as a function of the market share of Swisscom on the broadband market. They plan to achieve 90% of coverage in 5 years.

Basel: IWB ("Industriellen Werke Basel")

IWB plans to deploy an optical fibre network in the city of Basel. According to its plan, 80% coverage should be reached by 2020. In March 2009, IWB announced its cooperation with Swisscom regarding the construction of the local FttH network. They will put several fibres. Swisscom will not own any fibre, but rent one. Another one will be dedicated to IWB and the others are considered as reserve. The aim is to guarantee equal access for all providers, supposed to enhance competition.

St-Gall: SGSW ("Sankt Galler Stadtwerke")

SGSW and Swisscom successfully concluded negotiations in August 2009. They will deploy networks in a co-construction model and put 4 fibres per household. SGSW is in charge of the construction and owns the networks. Swisscom pays for the use of 2 fibres. They plan to complete the network in 5 years.

Geneva: SIG ("Services industriels de Genève")

SIG plans to invest 184 million Swiss francs during the next 15 years to achieve full coverage in Geneva. The model chosen is open access in order to allow interested providers to offer their services. SIG did not conclude any agreement with Swisscom.

Fribourg: Groupe E

Groupe E wants to achieve full coverage of the rural canton of Fribourg. It concluded a co-construction agreement with Swisscom specifying that 4 fibres will be laid to customers (to manhole). Groupe E and Swisscom will have one fibre each, while the 2 last fibres will be kept for interested actors (rent or purchase). At the present time, 2 pilot projects are under way in Fribourg. If results are conclusive, the model will be extended in order to reach full coverage in the canton in 2025 (260'000 inhabitants).

Obwald: EWO (Elektrizitätswerk Obwalden)

The rural and mountainous canton of Obwald also plans an extensive coverage with optical fibre networks (single fibre). EWO will build the network between 2010 and 2014. Cost are expected to be 31 million Swiss francs. At the end, 90% of coverage is planned in the Canton. Obwald does not plan a cooperation model with Swisscom. Only "Open Access" at Layer 2 should be provided for all interested parties.

BAKOM is not aware that the current agreements are binding. Such agreements may therefore still be subjects to changes.

Coordination of utilities

In October 2009, several electrical enterprises including EWZ, SIG, EWB, IWB and SGSW concluded an agreement in order to offer the identical range of wholesale products to service providers. This should allow synergies of local utilities offers and enable faster development of national offers for service providers on fibre networks (active line access).

A.3 Cabinet unbundling**A.3.1 Croatia**

According to the results of the market analysis of market No. 4, cabinet unbundling service (sub-loop unbundling) must be provided upon receiving reasonable request (within 90 days from reasonable request). Incumbent must assess whether the request is reasonable in accordance with the obligation of non discrimination which is also dependent on technical characteristics of its own network.

Access to the unbundled local sub-loop must be provided in two ways:

1. Incumbent must, in those locations where it installed its outside cabinet, while preserving network integrity, ensure space for the realization of the service of unbundled access to the local sub-loop, meaning that incumbent must ensure space for the termination of the operator's intermediary cable.
2. Incumbent must allow the operator, on the basis of its business decisions based on expertise, to install a street cabinet at some point of incumbent's access network although incumbent does not have or does not plan to install its street cabinet on that same point.

A.3.2 Denmark

Regulation

Based on the decision of May 1 2009 on the market for wholesale (physical) network infrastructure access (market 4) TDC has to grant access to collocation in the street cabinets.

If there is not sufficient space in the existing street cabinet to collocate the alternative operator TDC has to provide virtual collocation. NITA has described that this could be provided by establishing a separate cabinet just beside TDC's street cabinet. TDC then has to pay for the cable connecting their own and the alternative operator's cabinet.

Collocation prices are regulated by using LRAIC and collocation in the street cabinet has to be a part of TDC's reference offer. The information in the reference offer especially has to include:

- Information about collocation localities.
- Procedure for utilization of constructions and central equipments etc., including establishment of collocation for a supplier who has collocation access in several markets.
- Conditions for those entitled for collocation for access to inspect the places where there is physical collocation possibility, and places where collocation was denied referring to deficient capacity.
- Security aspects, that is, the security measures that are taken in the collocation places and security norms.
- Virtual utilization of constructions and central equipments etc.

A.3.3 Germany

On December 4 2009 BNetzA specified in a ruling chamber decision the conditions for access to Deutsche Telekom's access infrastructure. The decision requires Deutsche Telekom to provide a) access to the street cabinets, b) duct access, c) access to dark fibre (unless duct access is available). The general obligation to provide these services was already set out in the regulatory order of BNetzA's decision (June 27 2007) concerning access to the local loop, street cabinet access and access to ducts and dark fibre without however specifying the concrete access conditions for the services to be provided.

The services co-location at the cabinet, duct access and access to dark fibre constitute annex services for unbundling at a street cabinet.

In the context of the ladder of investment access to the street cabinet reflects the *left* side of the ladder showing the access products whereas duct access and access to dark fibre are elements of the ladder's *right* side (wholesale products to reach the access point).

Since summer 2008 Deutsche Telekom and competitors had tried to reach a voluntary agreement on these issues. In August 2009, Vodafone's fixed network division requested BNetzA to settle the dispute. This Vodafone case was now settled by BNetzA. Several similar other cases are pending, but will be decided soon based on the principles of the "pilot" decision.

Based on this decision BNetzA will determine the rates for these access products in a separate price control procedure based on the costs of efficient service provision (decision probably end of March 2010).

Deutsche Telekom is required to provide access to its street cabinets thereby enabling competitors to install their own DSLAMs. The cabinets have sufficient space for up to four further DSLAMs. Due to waste heat and depending on the power supply co-location may be limited to two further DSLAMs in practice.

- Deutsche Telekom is also required to provide *virtual* co-location by establishing a separate cabinet (connected via a patch cable) in those cases where access to the existing street cabinet is not possible.
- Co-location shall be provided for *within 6 months*.
- Provision shall take place on a *first come first serve* basis. This "*rule of priority*" satisfies the principles of equal opportunities, reasonableness and timeliness. It is considered superior – in particular for practical reasons – compared to other means of allocating possibilities for co-location, such as assignment by lottery or in separate tranches.

However, BNetzA reasoned that scarcity of duct access at a given location is rather unlikely. Given the economies of scale, a profitable exploitation of a specific street cabinet is considered only possible for a limited number of operators (in practice one may assume that for most cabinets there will be not more than two competitors requesting access). Also, an overlap of co-location requests is likely limited due to the fact that most operators will not provide service on a nation-wide but rather on a regional scale. For these reasons BNetzA assumed that in most instances Deutsche Telekom will be able to meet the demand for co-location at a specific location.

In order to better understand the rationale of this it may be helpful to briefly illustrate the properties of other conceivable mechanisms to assign co-location options:

- Assignment by lottery: Applying a lottery presupposes to determine in advance the degree of scarcity. One may either apply a short or a long time frame for such a lottery. A *short* time frame would require all interested parties to identify their demand within that short period. In practice this would not allow a serious identification of demand. Also,

operators who express their demand after this time frame would *de facto* be excluded from access to the cabinet. On the other hand, a *long* time frame would unduly delay the practical implementation of the access obligation.

- Assignment in separate tranches: Such a timely graduated procedure would require BNetzA to have an appropriate and feasible measure for: a) the question how to form such order allotments and b) how to determine the sequence for processing them. In particular, a) would additionally require BNetzA to reliably assess Deutsche Telekom's resources to process the requests. All these requirements are not met in practice.
- In order to prevent hoarding of co-location space, an operator's order will forfeit unless it installs its infrastructure within six months after the provision of co-location.
- Deutsche Telekom may exercise its *right of repossession* if virtual co-location is assured. Costs incurred by both contract partners resulting from this shift are borne by Deutsche Telekom.
- In order to provide sufficient space for competitors Deutsche Telekom may have to "*rear-range*" space assignments in its cabinets. Otherwise, inefficient usage of space within cabinets would make co-location impossible.
- If necessary, Deutsche Telekom has to renew technical systems (for waste heat or power supply).
- Deutsche Telekom is not entitled to an explicit *reserve*. This would be inappropriate considering that Deutsche Telekom has not yet submitted a technical migration concept or a binding time-table.
- Fault clearance (in case of cable disruptions) has to be provided within 6 hours.

A.3.4 The Netherlands

Regulation and reference offer

Based on our market 4 analysis of 19 December 2008 KPN is obliged to offer unbundled access to the street cabinet including the ancillary services collocation and backhaul facilities. An alternative operator has the option to install his own equipment in the street cabinet or install his equipment in a separate cabinet. The design of the street cabinets facilitates the access of multiple operators. The backhaul services are offered as dark fiber and Ethernet. Backhaul is regulated from the street cabinet up to a higher point in the network (the MDF or an other aggregation point in the incumbents NGN network).

There is a non-discrimination obligation in place and a transparency obligation, including the obligation to publish a reference offer. KPN is obliged to charge cost-oriented tariffs (EDC).

Experiences

Street cabinet unbundling became an issue in the Netherlands after the announcement of the incumbent NGN roll-out plans in 2005. In 2005 KPN announced the phasing out of MDF-access and a large roll-out to cabinet unbundling (FttC). After this announcement of KPN a reference offer, including tariffs was implemented between KPN, competitors (mainly Bbnd) under the supervision of OPTA.

The NGN plans of KPN have developed and been altered since 2005. On the one hand MDF access will be available for a much longer period and KPN and competitors are planning to offer VDSL from the MDF. On the other hand KPN has chosen a more mixed strategy of Fiber roll-out (FttH and FttO) and VDSL roll-out (FttC and VDSL from the MDF). In this strategy fiber roll-out is currently dominating.

Currently there are 5 FttC pilot cities by the incumbent. The incumbent is first targeting a commercialization of 450.000 homes passed now before rolling out further. The business case of subloop unbundling is difficult for competitors. Analysys Mason conducted a study for OPTA on the business case of subloop unbundling and concluded that due to economies of scale a business case on FttC by competitors will only be possible on a limited scale, for example in areas with mainly business customers. Currently no alternative provider is using the SDF-access service of the incumbent.

A.3.5 Norway

In NPT's current decision for market 4, sub-loop unbundling (hereunder unbundling at the cabinet) is part of the incumbent's regulated offer. Access shall be given on reasonable request and non-discriminatory terms, but no details are given in the decision regarding specifications for the cabinets.

The incumbent's reference offer contains detailed descriptions (including technical descriptions) of the offering of both access to sub-loop unbundling and ancillary services.

A.4 Fibre unbundling

A.4.1 Croatia

On the basis of the conducted analysis of market No. 4, it is concluded that incumbent must, within 90 days from the receipt of a reasonable request for the service of unbundled access to fibre-based local loop based on point-to-point solution, specify and publish conditions, time limits and prices of the service of unbundled access to fibre-based local loop based on point-to-point solution in the reference offer for unbundled access to the local loop and related facilities.

A.4.2 The Netherlands

Roll-out of FttH networks

In the Netherlands Reggefiber (which is a joint venture of Reggeborgh and KPN) is rolling out FttH. The FttH is build as an passive fibre architecture. To each household two individual fibers are put in. One fiber is mostly used for the provisioning of analogue TV and the other is used for the provisioning of Ethernet-based internet services. Reggefiber is typical connecting 2500 households to one AreaPoP, where the fibres are connected to the optical distribution frame (called the ODF). A number of AreaPops (typical 10 - 20) are connected in a fiberring with the CityPoP.

Reggefiber is providing an open access based on 'unbundled fibre' (called ODF Access), in combination with the provisioning of collocation services (in the AreaPoP) and backhaul services (from the AreaPoP to the CityPoP). The backhaul services are offered as dark-fibre services.

In addition to the rollout of FttH networks by Reggefiber also a number of market players (KPN, EuroFiber, Colt Telecom, Tele2, BT NL, Verizon NL, Ziggo, UPC/Priority telecom, Delta/Zelandnet, ...) have invested in the roll-out of FttO networks. In dense city business areas as well as on business parcs. These rollouts have been done starting in the late 80-ties and especially on business parcs these are continued to be rolled out.

Regulations

In the market-analyses (finalised December 2008⁹) the unbundled fibre service (ODF Access) is defined in the same market as unbundled local loop services (MDF and SDF Access). KPN and its joint venture Reggefiber has been identified as market players with severe market power (SMP) for this wholesale market.

Based on these SMP an access obligation applies for Reggefiber for the non-discriminatory provisioning of ODF Access and the ancillary services Collocation and Backhaul. This access obligations also contains the publication of a Reference Offer (see website Reggefiber¹⁰), including tariffs.

For the tariff regulation a separate policy paper has been drawn by OPTA (verwijzing website) in which the pricing principles of tariff regulations for ODF Access is described. Key point is to strike a balance between stimulating investments (and innovations) and remain a competitive environment. Based on the principles OPTA has set a tariff ceiling for ODF Access, Collocation and Backhaul Services. (see website OPTA¹¹).

⁹ <http://www.opta.nl/nl/actueel/alle-publicaties/publicatie/?id=2805>

¹⁰ <http://www.reggefiber.com/odf-toegang.html>

¹¹ <http://www.opta.nl/nl/actueel/alle-publicaties/publicatie/?id=2976>

Important element of the tariffs is that the prices depend on the actual CAPEX per line in an developed area (called 'aansluitgebied'). Depending on the characteristics of the area (dense or more rural) a different tariff applies. These tariffs range from 12 – 17 Euro per line/per month (without discount) and 100 Euro installation fee.

The business networks (FttO) can also be technically unbundled, in the same manner as the rolled out FttH networks. OPTA has decided to include the unbundling of these FttO-networks in the same market as FttH and MDF unbundled access. And as a result KPN has to provide unbundled FttO-Access.

In October 2009 the court decided that there was a lack of evidence in the market analyses for this conclusion (that FttO belongs to the same market) and asked OPTA to analyse this more in depth. As a result the remedies for FttO-access have been suspended.

One of the main questions related to motivation of the inclusion of FttO-access in the market of MDF Access is the perceived price difference (and possibly cost difference) between an nationwide copper network access and a area-based fibre network access (only in dense business areas).

Current experiences with regulations of FttH Fibre unbundling

The rollout of FttH progresses according to plan. Currently almost 400k users are connected to FttH. KPN recently announced plans shows that between 1 and 1,5 Million household are planned to be connected at the end of 2012. Which is a growth of around 250k households per year.

The unbundling of FttH shows in almost each area that only one active operator is using the ODF Access service. This can be KPN or another operator. Multiple ODF Access operators (within the same area) are only present in a very small number of locations.

KPN has decided to switch to an single fiber solution without analogue TV. This means that in a number of "KPN" area's one fiber is not utilised for the provisioning of services.

Within the Industry group under the supervision of OPTA a number of interested market players and Reggefiber have discussed the reference offer of Reggefiber. One of the outcomes is that the current collocation design of AreaPoPs will be altered by Reggefiber. The new design is also allowing for smaller companies to take up the ODF Access service.

Scale is showing to be an important factor in entering the unbundled access market. Both scale on the availability of FttH (in the total potential dutch market), but also scale within an area (e.g. the number of lines per AreaPoP).

The use of passive lines allows operators to choose their own type of technology (e.g. PoN or PtP or WDM). This allows various type of operators to make use of the network. Also business operators are showing interest in using the FttH network for connecting business customers. For example EuroFiber (a large fibre-based operator which sells large bandwidth ser-

ices to operators and to business customers) has recently signed an ODF Access agreement with Reggefiber. Also KPN is developing a business portfolio via FttH.

A.5 Enhanced bitstream products currently available

A.5.1 Belgium (VDSL)

In its market analysis decision of January 18th 2008 the Belgian regulator BIPT has foreseen that Belgacom should make a wholesale bitstream access offer based on VDSL2 available.

On 30th of September 2009 the BIPT decided to add additional elements to the WBA proposal from Belgacom so that it had enough possibilities and functionalities for the alternative operators to diversify their retail products.

The Belgian WBA VDSL2 bitstream offer includes:

- The possibility to give premium clients their own private network with dedicated VLANs and symmetric profiles, while for mass market purposes, shared VLANs and asymmetric profiles with different download speeds are available.
- Different QoS levels: P=0 (best effort), P=1 (low priority), P=3 (medium priority), P=5 (highest priority) and P=6&7 (control functions). Two VLAN per QoS level can be ordered per OLO.
- The size increments of VLANs are chosen small enough so that the costs don't decrease disproportionately when a bigger VLAN is needed.
- Flexible interconnection at regional (5 areas) & local level (MDF). 5 points of interconnect needed to obtain national coverage.
- Alternative operators have the opportunity to choose their modem type and vendor as soon as the broadband forum has published its technical requirements on performance and functionality¹² boosting VDSL2 chipset interoperability.
- SLA on provisioning & repair

12 TR-114: VDSL2 Performance Test Plan; TR-115: VDSL2 Functional Test Plan; TR

A.5.2 Croatia

VDSL

Incumbent must, if it is building a network based on FttCab concept, in its reference offer for wholesale broadband access specify terms and conditions, time limits and prices of bitstream access service at IP level on the basis of FttCab solution 6 months before offering at the retail level services based on FttCab.

Incumbent must, if it is building a network based on FttCab concept, within 90 days from the receipt of a reasonable request for bitstream access services at Ethernet and DSLAM levels or a corresponding point based on FttCab solution, in its reference offer for wholesale broadband access specify terms and conditions, time limits and prices of bitstream access service at Ethernet and DSLAM levels or a corresponding point based on FttCab solution

FTTH

Incumbent must, on 1 January 2010, in its reference offer for wholesale broadband access specify and publish terms and conditions, time limits and prices of bitstream access service at IP level on the basis of FttH solution (for both P2P and PON solutions).

Incumbent must, within 90 days from the receipt of a reasonable request for bitstream access services at Ethernet and OLT levels or a corresponding point based on FttH solution, in its reference offer for wholesale broadband access specify and publish terms and conditions, time limits and prices of bitstream access service at Ethernet and OLT levels or a corresponding point based on FttH solution (for both P2P and PON solutions).

Multicast/VLAN

Incumbent must ensure technical conditions for providing the service of a separate virtual channel (PVC or VLAN) for VoIP and IPTV, as well as technical conditions for additional 2 private virtual channels which are not explicitly related to a certain service in order to enable competitors to provide whole range of services to the end users.

Incumbent must, on 1 January 2010, incorporate in the reference offer for wholesale broadband access technical conditions for the services of a separate virtual channel for VoIP for the purpose of providing a publicly available telephone service, for IPTV for the purpose of providing the service of IPTV, and within 60 days from the receipt of a reasonable request, for the service of a private virtual channel which is not explicitly related to a certain service.

A.5.3 Denmark (VDSL)

Regulation

Based on the decision of December 22 2009 on the market for wholesale broadband access (market 5) the SMP operator TDC has been imposed an obligation to grant access to BSA via both copper and the cable-TV network.

BSA access via the copper network grants access to broadband from the end user to the:

- Nearest Ethernet layer 2 switch or an equivalent point (product 1)
- Nearest Ethernet layer 3 router/switch or an equivalent point (product 2)
- Ethernet layer 3 router/switch or an equivalent point on a more central location than the above mentioned solutions, including if necessary transportation in the IP/MPLS network (product 3)

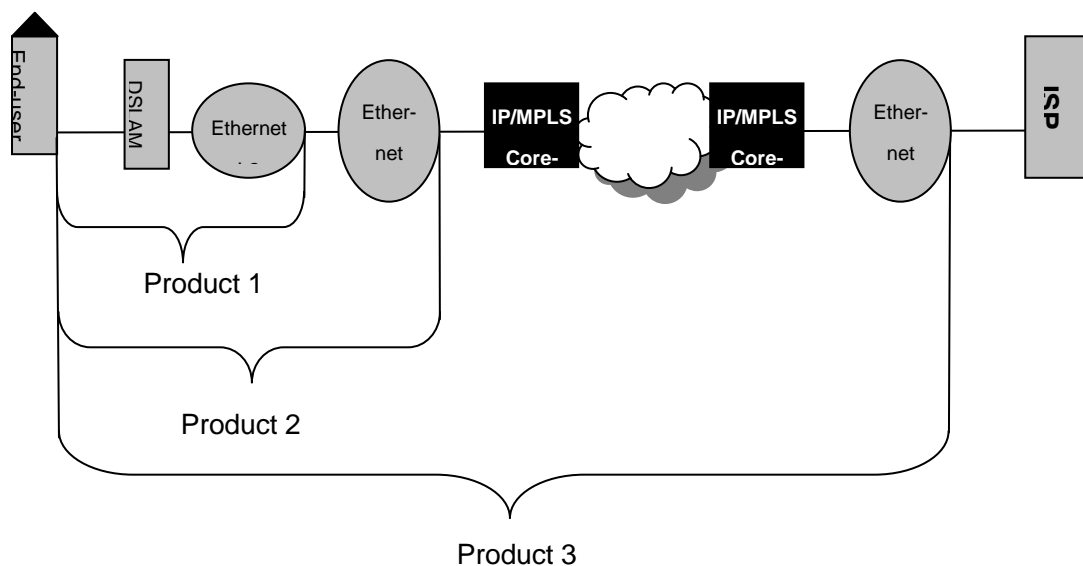


Figure: Illustration of the extent of the 3 broadband access products based on copper

BSA access via the cable TV network grants access to broadband from the end user to the:

- Nearest Ethernet layer 3 router/switch or an equivalent point (product 1)
- Ethernet layer 3 router/switch or an equivalent point on a more central location than the above mentioned solutions, including if necessary transportation in the IP/MPLS network (product 2)

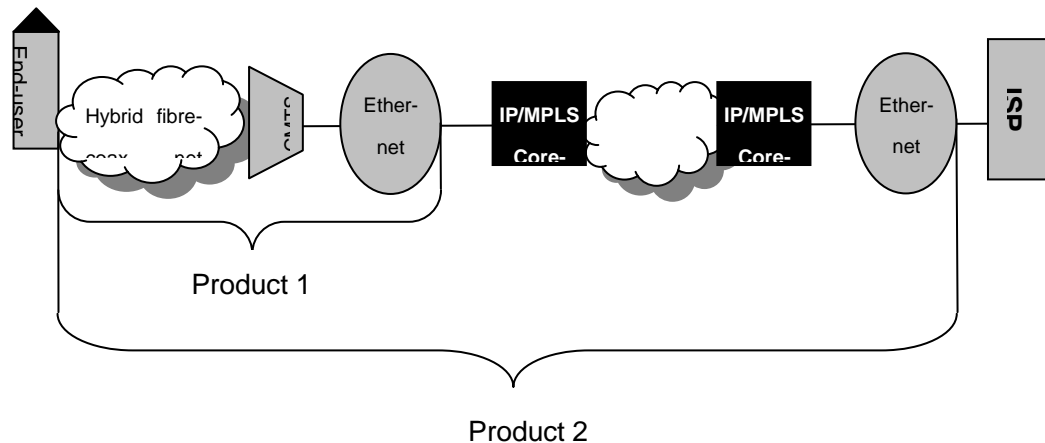


Figure: Illustration of the extent of the 2 broadband access products based on cable TV network

TDC shall respectively via the copper network and the cable TV network provide access to all functionalities that can support a supply of broadband products, devoted to end-users. It is a requirement that it is used by TDC itself. Regarding the copper network the examples of such functionalities are multi-channel offerings, multicast and unicast. Regarding the cable TV network, there are however at this stage to be significant capacity problems in relation to such services, therefore it would not be reasonable and proportionate to impose TDC to grant access to multicast on the cable TV network. This is due to the fact that the cable TV network is access to a shared capacity.

The prices for both BSA via the copper and the cable TV network are regulated by using LRAIC.

Regarding BSA via the cable TV network there is not yet developed a LRAIC price model. This model has to be developed and the wholesale prices have to be found before granting access to BSA. Subsequently the other network operators are able to request access and TDC has then got an implementation period of 6 months before the access has to be established.

TDC has to publish a reference offer for both BSA via the copper and the cable TV network.

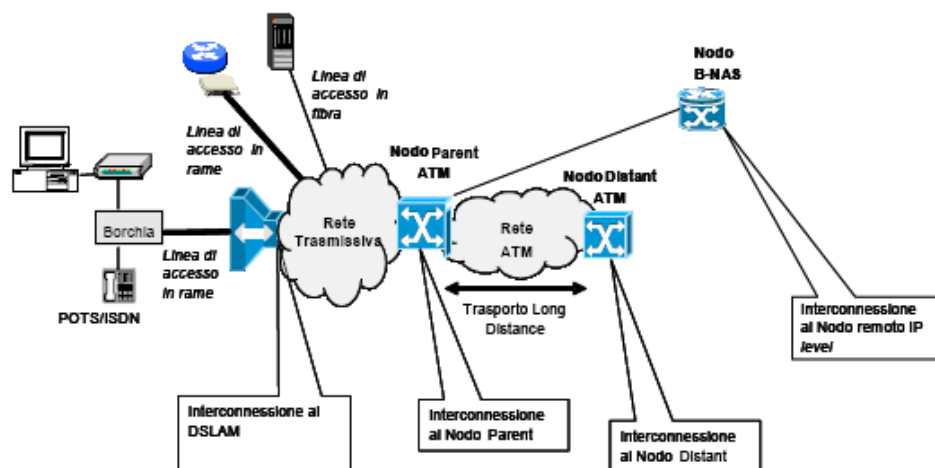
A.5.4 Italy (ADSL2+, SHDSL, GBE/Fibre, ATM, multicast)

In Italy the Reference Offer for bitstream services includes the technical and economic conditions for the provision, by the incumbent operator (Telecom Italia), of the transmission capacity between the user location and the interconnection interface of the authorized operator who, in turn, wants to offer broadband services to its customers.

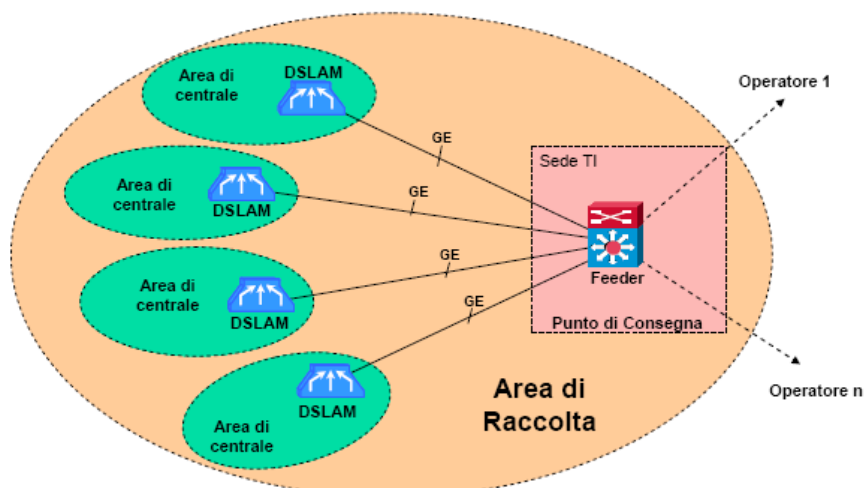
Telecom Italia provides bitstream services through the interconnection at the DSLAMs located at the MDF sites (SL) which are currently not open to the unbundling access services (Full Local Loop Unbundling and Shared Access), at the ATM and Ethernet switching nodes of the data transport network (parent switch, Distant switch), and at the remote IP level node.

Operators can choose the level of network interconnection, to deliver/collect the broadband traffic generated by their customers, according to own network architecture and principles of economic convenience.

The following figure shows the bitstream architecture for ATM and Ethernet services.



ATM Network Architecture



Ethernet Network Architecture

The ATM bitstream offer includes the following access services from the customer network termination to the OLO interconnection interface: ADSL, ADSL 2+, SHDSL, 34/155Mbps (using ATM/SDH protocol). The Operator pays a flat fee (x Euro/month) for the access com-

ponent (that can be shared with PSTN/POTS or naked) and a flat fee for transport (y Euro/kbps) of data traffic from the DSLAMs (of the relevant collect area) to the parent node. Currently the Ethernet bitstream offer provides ADSL2+/SHDSL access. Optical fiber GBE access will be included in the terminating Reference Offer.

For both bitstream components (access and transport) AGCOM defined (with decision n. 34/06/CONS and n. 249/07/CONS) a price control mechanism based on cost orientation. It has just been concluded the new bitstream market analysis (Resolution 525/2009/CONS) which foresees the use of a price cap (from 2010 to 2012) for access and transport prices starting from the prices approved for 2009. The cap will be defined according to a LRIC model to be defined within may 2010. Other ancillary bitstream services will be based on cost orientation obtained according to a FDC approach.

Resolution 525/09/CONS confirms the obligation, for the incumbent, to provide multicast service at Ethernet level, thus enabling the transmission, from the parent node or from the DSLAM, of many IP/TV channels to many end customers.

A.5.5 The Netherlands (VDSL, Ethernet/Fibre)

Regulations

In the Netherlands the wholesale broadband & leased line market is divided into 4 individual markets. The wholesale broadband market consists of the market for low quality wholesale broadband services (sometimes referred to as consumer bitstream) and the market for high quality broadband services (sometimes referred to as business bitstream). The overbooking-factor defines low ($> 1:20$) and high quality services ($1:20 < 1:1$). The wholesale leased line market consist of the market for low capacity lines ($\leq 20\text{Mb}$) and the market for high capacity lines ($>20\text{Mb}$). All leased lines are non-overbooked services (1:1).

For all markets KPN has SMP. For WBT-Low Quality no access obligations applies for FttH-based services. For all other services an access obligations applies. These access obligations include the publication of a reference offer.

For WBT-Low Quality no price regulation applies.

Important element is that the wholesale provisioning of multicast (especially for the broadcast of TV) is not part of the access obligations for WBT. This is due to the fact that the TV-market is not dominated by KPN, but by the cable providers, and is defined as a separate market. (so no triple play market). So this is not part of the regulated WBT service. Therefore all service providers offer their TV-services based on their own ULL or FttH network footprint.

The consumer WBT offer is offered as ATM-based service as well as Ethernet service. This service is based on a Point-to-Multipoint VLAN with 'best effort' quality. This includes ADSL, ADSL2+ and VDSL2 capabilities. (see reference offer KPN¹³)

The standard business WBT offer consists of an ATM service for ADSL(2+) and SDSL. An Ethernet Service is under development for VDSL2, FttH and FttO. This developed service is offered on the basis of a Point-to-Multipoint VLAN with best effort or premium quality. For FttO services KPN also offers a special business service which is offered on the basis of a Ethernet Point-to-Point VLAN per connection. It includes premium and best effort service levels. (see reference offer KPN)

With the introduction of VDSL2 (both as FttC as well as from the central office) a discussion in the spectral user group has arisen about the availability of upload spectrum in the mask. Business users require high upload speeds (symmetrical), consumer users (with TV) require asymmetrical bandwidth with higher upload speeds. These cannot be combined in one mask.

A.5.6 UK

BT Openreach has been developing a range of new bitstream wholesale products for use over its planned FttC and FttH access networks. These Ethernet-based products, called Generic Ethernet Access (GEA) are at the trial stage for both GEA-FTTC and GEA-FTTP. While there are some necessary differences between the variants of GEA (for example the maximum bit rates that can be achieved), the objective is for the product to be largely technically neutral of the underlying access technology.

A.5.6.1 Current product description

Some relevant parts of BT's description of the product (GEA-FTTC)¹⁴:

The product is designed to give maximum flexibility for Communication Providers (CPs) to differentiate their service at the Internet Protocol (IP) layer and above, including setting end user broadband speeds.

The Ethernet service to the premises is delivered on a single Virtual Local Area Network (VLAN) and is presented to the CP via one (or more as required by CPs) GEA Connectivity Handover (1Gbit/s) from an Ethernet switch in the PoH.

The FTTC infrastructure underpinning the product is deployed as an overlay to the existing copper network between the exchange and the Primary Cross-connection Point (PCP) and

¹³ www.kpn-wholesale.com

¹⁴ [http://www.openreach.co.uk/orpg/products/nga/fttc/downloads/GEA_over_FTTC_Product_Description_Issue_1%205%20\[14%20July%202009\].pdf](http://www.openreach.co.uk/orpg/products/nga/fttc/downloads/GEA_over_FTTC_Product_Description_Issue_1%205%20[14%20July%202009].pdf)

will provide a fast connection over Very high speed Digital Subscriber Line 2 (VDSL2) as an alternative to Asymmetric Digital Subscriber Line 2+ (ADSL2+) based broadband over the traditional exchange-terminated copper network. CPs will be able to provide their broadband services over this active network connection.

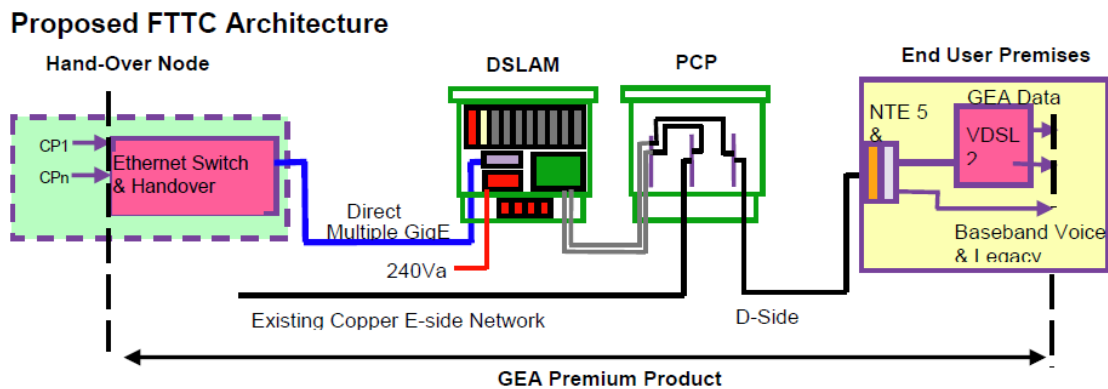


Figure: Proposed FTTC Architecture

Baseband voice service can be provided by either the same CP (using either WLR or MPF products) or a different CP (using WLR) over the existing copper network on the same copper pair used by GEA.

The GEA over FTTC product will offer the following VDSL2 line rates:

- 40Mbit/s Peak downstream, with 2Mbit/s Peak upstream
- 40Mbit/s Peak downstream, with 5Mbit/s Peak upstream (not available until R1100)

The actual rate achieved by the line may be less than 40Mbit/s and is known as the Peak Information Rate (PIR).

Downstream Prioritisation Rate

Within the overall Peak Information Rate for the product, a 20Mbit/s 'Prioritisation Rate' (PR) will also be applied. When a CP sends traffic at an instantaneous rate above the Prioritisation Rate, this traffic may be discarded if there is network congestion. We would expect that under congestion, each GEA Data Port will receive the lower of the Prioritisation Rate, or their current line rate.

The CP can mark traffic as either "Can drop" or "Should not drop" using 802.1p markings as described in the SIN. This marking is optional. Where the CP has marked frames as "Should not drop" in the CVLAN, "can drop" and unmarked frames are always dropped from that CVLAN first. The use of frame marking by a CP for one end user has no impact at all on traffic for any other end user.

Standard Features

GEA over FTTC service is provided and assured on the Openreach Equivalence Management Platform (EMP). Orders and faults can be submitted either via the on-line internet based Portal or via ebXML transactions (not currently available).

Order and Fault updates are provided to CPs via Keeping Customer Informed (KCI) notifications, additionally KCI Order and Fault message information is available via the order and fault trackers.

Connection of the GEA service will involve an Openreach engineer visiting both the roadside cabinet (PCP) and the end user premises, the end user will be required to be present.

For GEA and WLR/PSTN the CPs providing the services can be different or the same, for MPF the CP providing the GEA and MPF must be the same.

A.5.6.2 GEA future plans

According to the Undertakings that BT gave Ofcom in 2005, Openreach was not allowed to control and operate electronic equipment in BT's access network. Ofcom agreed a variation to the Undertakings in June 2009 which allows Openreach to control and operate electronic equipment necessary to provide super-fast broadband services using FTTC. In response to comments raised by other CPs about GEA during consultation process, the variation included a number of relevant modifications.

Ofcom considered that the GEA active (or electronic) wholesale product could be important in enabling effective competition in the provision of super-fast broadband services to consumers. One concern raised was the possibility that GEA may not offer sufficient flexibility to allow CPs to differentiate their retail propositions. Ofcom agreed that such flexibility is important to enable effective downstream competition, and have previously consulted on technical requirements which set out the goals that an active wholesale product should achieve (known as Ethernet ALA). BT has confirmed to us that it intends that GEA will reflect fully the goals described in those requirements. A change was made to the variation to make this intention manifest. This change does not provide detailed product specifications, and Ofcom considered that the appropriate process for their development is engagement between Openreach and CPs.

Ofcom have also considered requests to make Openreach's obligations in respect of its consultation (with its CP customers) more explicit, and to assure further transparency in Openreach's approach to its consultations. Following these considerations, Ofcom agreed with BT changes to the variation which commit Openreach more explicitly to develop its product roadmap by consulting with its customers and to document clearly the reasons for the decisions it takes on questions put forward in its consultations on active FTTC products.

The variation requires BT to provide any GEA product in ways which ensure that:

- (i) it has robust and scalable processes and systems supporting provision, migration, monitoring and fault repair such that Communications Providers using that product are able to provide their End-Users with a reasonable experience (in terms of delivery within reasonable timescales and with minimal disruption);
- (ii) its availability, in such locations as that product is offered, satisfies reasonable Communications Providers' demand;
- (iii) it conforms to appropriate industry standards;
- (iv) the contracts for its provision include SLAs; and
- (v) there is timely delivery against the product roadmap developed in accordance with section 5.54."

and in section 5.54)

- (i) it is developed in accordance with a product roadmap developed through effective and appropriate ongoing consultation with (Openreach's) customers. The consultation process must consider, on an on-going basis, the specification of that product, the Ofcom Ethernet Active Line Access, Updated Technical Requirements published on 3 March 2009 as amended from time to time and monitor the development, operation and deployment of that product.

A.6 Duct Access currently available

A.6.1 Austria

By virtue of an amendment of the Austrian Telecommunications Act entering into force as from August 2009 it is now possible for any communications network operator to request from an infrastructure owner (e.g. communication, electricity, tele heating, gas, etc.) the joint use of that owner's (communications) infrastructure, e.g. cable ducts, tubes, chambers or parts of it. Provided that such a request is economically reasonable and technically justified such infrastructure sharing now has to be granted by law. The legal obligation for granting infrastructure sharing does not depend on the status of the infrastructure owner, i.e. this applies to any owner of infrastructure regardless whether that infrastructure owner is providing communications services itself or not. The infrastructure owner will receive a reasonable monetary compensation which takes into account costs for building the infrastructure to be shared including acquisition costs, recurring operational expenses, costs associated with the sharing, and being based on commercially available charges.

Furthermore, on the regulatory front duct access will be taken into account as an ancillary service to sub-loop unbundling on the relevant market for access to physical infrastructures. In that case duct access could be used for providing backhaul services connecting cabinets in streets or buildings to the MDF (or a similar concentration point in an NGA) or to an alternative operator's POP.

In addition, Austrian incumbent operator Telekom Austria recently announced a voluntary duct offer for all their NGA (new build) areas. Telekom Austria plans to deploy ducts and microducts to their newly built or adapted NGA access points in street cabinets (FTTC) or buildings (FTTB). The offer comprises access to microducts with an inner diameter of 8 mm or 4 mm (with the latter offering space for up to 12 fibres) with one endpoint of the duct being located at the central office of a dedicated access area and the other at an access point closer to the customer within the same access area. The specific modalities of that offer are currently discussed with alternative operators in an industry working group initiated by Telekom Austria.

A.6.2 Croatia

Ordinance on Manner and Conditions of Access and Shared Use of Electronic Communications Infrastructure and Associated Facilities¹⁵ that entered into force in December 2008 enabled, under fair conditions, the usage of free space in cable ducts to all operators. Free space and rational usage are clearly defined within the Ordinance. Cases of improved usage of micro-ducts are also stated. The above mentioned, enables all operators to share the built infrastructure.

Free space in a cable duct is defined as any unused space greater than the maximum cross section of the largest cable in a cable duct. Moreover, any cable that has not been used for longer than 6 months is considered free space as well.

Ordinance puts an obligation that direct pulling in of fiber optics cable into large diameter duct is not allowed, but a protective small-diameter duct or a microduct must be installed first. Each cable shall be placed in its own duct or a microduct.

Ordinance also prescribed acceptable combinations of small diameter ducts to fill in the free space in large diameter ducts, as well the efficient way of using free space by possible combinations of small diameter ducts or microducts.

Existing free space in large diameter ducts shall be filled with small diameter ducts, either of the same or different diameters. The use of the following small-diameter ducts is allowed: PE 20, PE 25, PE 32 and PE 40.

15 <http://www.hakom.hr/UserDocslImages/dokumenti/Ordinance%20on%20shared%20use%20of%20infrastructure.pdf>

Table 1 prescribes acceptable combinations of small diameter ducts to fill in the free space in large diameter ducts.

Table1

No.	Combination of small diameter pipes	Free space required
1	1xPE40+2xPE32+2xPE25	$\Phi > 95$ mm
2	2xPE40+2xPE32	$\Phi > 95$ mm
3	4xPE32	$\Phi > 90$ mm
4	1xPE40+2xPE32	$\Phi > 85$ mm
5	3xPE32	$\Phi > 80$ mm
6	3xPE40	$\Phi > 95$ mm
7	2xPE40	$\Phi > 90$ mm
8	≤ 14 xPE20	$\Phi > 95$ mm

On condition that a large diameter duct is occupied only by one cable, Table 2 specifies the efficient way of using free space by possible combinations of small diameter ducts or microducts:

Table 2

No.	The existing cable diameter (mm)	Duct combinations to occupy free space
1	$\Phi \leq 40$	PE40+2xPE32
2	$40 < \Phi \leq 50$	PE32+2xPE25
3	$40 < \Phi \leq 50$	PE25+2xPE20
4	$50 < \Phi \leq 60$	PE20 +2xPE16/12
5	$50 < \Phi \leq 60$	MC16/12 +2xMC14/10
6	$60 < \Phi \leq 70$	MC14/10+2xMC12/8
7	$70 < \Phi \leq 80$	MC12/8+2MC7/4
8	$70 < \Phi \leq 80$	2MC 7/4
9	$\Phi > 80$	-

In case where two or more cables occupy a large diameter duct, and more suitable free space does not exist in the ducting system, then the available free space shall be used by pulling in one or maximum two small diameter ducts or a larger number of microducts enabling maximum usage of free space.

All duct combinations, in accordance with the detailed plan shall be pulled into the free space simultaneously. All pulled in ducts become the property of the infrastructure operator.

The operator for whom such detailed plan has been produced is liable to pay the expenses of the installation works according to the detailed plan (pulling out of unused cable, pulling in ducts to fully occupy the free space, maintenance or widening of ducts and similar).

Available space within small diameter ducts can be filled with one or more microducts of appropriate diameter. Table 3 specifies possible types of microducts that can be installed within small diameter ducts (combination of various microducts types is permitted):

Table 3

Outer diameter of the duct (mm)	Maximum number of microducts that can be installed		
	12/10	10/8	7/5.5
50	7	8	15
40	4	5	10
32	2	3	7
25	1	1	3

A.6.3 Denmark

Regulation

Based on the decision of May 1 2009 on the market for wholesale (physical) network infrastructure access (market 4) the SMP operator TDC has to grant access to unbundled local loops.

Furthermore TDC is imposed an obligation to grant access to the backhaul section from advanced connection points to a higher-lying point in the network.

TDC shall grant access to the backhaul section in two versions:

1. Access to using TDC's ducts in backhaul sections
2. Access to renting unbundled (whole) fibre (dark fibre) in backhaul sections

The prices are regulated by using LRAIC and TDC has to publish a reference offer containing access to backhaul (ducts and dark fiber) with particularly regarding backhaul information such as:

- Information about ducts.
- Procedures for utilization of ducts, under this, for establishing and carrying forward own and other operators' traffic.

A.6.4 France

Ducts access obligation under market 4 analysis

In July 2008, ARCEP published its analysis of market 4¹⁶:

- ARCEP identified a relevant market, including all the physical infrastructures used for broadband (access to the copper loop) and very high broadband (access to the fiber loop, access to ducts)
- France Télécom was considered to have SMP on the whole relevant market
- ARCEP mandated France Télécom to give access to its copper pair and to its ducts on a transparent and non-discriminatory basis and at cost-oriented tariffs
- ARCEP did not put any asymmetrical obligation to France Télécom on access to the fiber loop at this point, considering the symmetrical obligations for the sharing of the last part of the fiber loop, set up with the adoption of the “Loi de Modernisation de l’Economie” in August 2008.

Access to existing civil works infrastructures (ducts and chambers) was considered by ARCEP to permit to change considerably the business model of an operator who rolls out its optical fiber local loop network. Alternative operators initially announced their deployment only in cities where alternative civil works infrastructures exist (sewer system in Paris). Access to existing ducts had to be ensured to encourage all operators to invest in new optical fiber access networks. In this context, the ducts of France Telecom, inherited for the former monopoly, were considered as an « essential facilities ».

Preparatory works

ARCEP engaged works on the wholesale access offer to France Télécom’s ducts mid-2007 (technical discussions with France Télécom, workshops gathering all operators chaired by ARCEP...)

During the summer 2007, ARCEP made an audit of the availability of spare capacity in France Télécom’s ducts :

- the audit was done in some areas in 10 cities, with the collaboration of France Télécom
- the audit showed that there were availability in France Télécom’s ducts to envisage the rolls-out of several fiber optical networks in parallel
- although, the availability was relatively heterogeneous between the different cities and the different areas (downtown, suburbs, newly constructed areas etc.).

¹⁶ Decision n° 08-0835

A first wholesale offer was proposed by France Télécom to the operators at the end of 2007, on a commercial basis, under the pressure of the engagement of a procedure by the Competition authority, so as to do experiments in order to test and validate the processes and engineering rules suggested by France Telecom.

Ducts reference offer of France Télécom

France Télécom released the first public version of the reference offer to wholesale access to its ducts on September 2008. A second version was published on April 2009¹⁷.

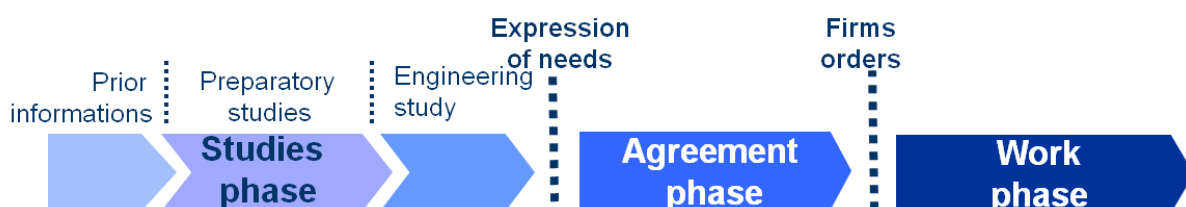
The access to ducts is authorized for fiber cables on the purpose of Fttx networks only. The offer can not be used for copper or coaxial cables, or for fiber backhaul networks.

The access does not consist on the rental of a single duct on its own, but rather on a right of way for fiber cables.

Operational process

The main objective of the ducts access offer, on the operational aspect, was to enable alternative operators to be as autonomous as possible, in the different parts of the process.

Thus, France Télécom lets the alternative operators realize the main parts of the operational process (assessment of the spare availability, roll out of fiber cables..), and only intervenes in the verification parts (cf. diagram below). Alternative operators have to give guarantees to France Télécom concerning the work of their subcontractors, regarding security, integrity of the network...



France Télécom has to provide preliminary data to alternative operators concerning the localization and the capacity of its ducts network. France Télécom has regional data bases, some through GIS (geographical information system), but the information is not reliable regarding the availability of spare capacity.

All the data collected by a first operator rolling out its fiber cables on an area, regarding the spare capacity, is gathered by France Télécom, and is at the disposal of other operators.

¹⁷ http://www.orange.com/fr_FR/groupe/reseau/documentation/att00005989/Offre_GC_version_du_29_04_2009_publiee.pdf

In particular, under the non discrimination obligation, France Télécom has to apply the same process for its own rolls out, through the determination of protocols for internal provision.

Discussions on operational process with France Télécom and alternative operators are still in place in workshops chaired by ARCEP.

Engineering rules

Engineering rules are defined, so as to share the capacity between several fiber networks and to avoid cases of preemption.

The principles of the engineering rules are :

- optimization of the available space, with the use of sub-ducts
- obligation to leave as much space available as the space used for one's fiber cables
- possibility of installation of passive equipment in the chambers
- specific rules for adductions of buildings

France Telecom has also to apply these engineering rules for its own rolls out.

ARCEP is gathering data on rolls out so as to discuss these rules with France Télécom and make improvements.

Tariffs

Tariffs of the access to France Télécom's ducts are currently under revision : on 17th December 2009, ARCEP released a public consultation on the economics conditions of the access to the civil engineering infrastructures of France Télécom¹⁸.

The ducts infrastructures of about 450 000 kilometers, accompanied by air support in less dense areas, actually bear the copper cables of the telephony network and represent a cost of about one billion euros per year for France Telecom. This cost is being recovered through all the wholesale and retail products, which use the 32 million pairs of the copper telephony network, at a cost of about 3€ per month per pair.

With FTTx deployment, this cost will have to be borne jointly by the copper and fiber networks, through the ducts offer, in a context where, over time, copper is likely to disappear and be replaced by fiber.

¹⁸ http://www.arcep.fr/uploads/tx_gspublication/consult-acces-genie-civil-ft-171209.pdf

A.6.5 Germany

Based on its decision of June 27, 2007 requiring Deutsche Telekom to provide duct access, BNetzA specified in its decision of December 4 2009 the conditions to provide duct access between the MDF and the street cabinet. The provision of duct access constitutes an annex service to unbundling at the street cabinet (see above A.3.1 Cabinet Unbundling).

- The competitor *itself* may install fibre cables. If this had to be done by Deutsche Telekom, the competitor's flexibility would be reduced as it would rely on Deutsche Telekom (in particular in cases of fault clearance).
- BNetzA ruled that this does not infringe upon Deutsche Telekom's concerns as regards network security. To take account of that the competitor may only access cable ducts supervised by Deutsche Telekom representatives.
- Access is provided only to a *fourth* of the duct. It is reasoned that an even greater granularity was not justified considering that the economies of scale (→ number of customers accessible) do not allow an efficient utilization by more operators.
- In case there is not enough space between MDF and cabinet to provide a complete duct or a quarter duct, Deutsche Telekom shall provide the vacant space, if it is possible to either install a duct divider subsequently or to lay optical fibres.
- Duct access shall be provided *within 6 months* after the competitor's ordering. This time frame was considered reasonable because Deutsche Telekom needs to have sufficient flexibility to meet this time frame even in cases of simultaneous orders by several competitors.
- Furthermore, it may terminate this provision with 18 months notice if the cable ducts are closed or relocated. In the latter case Deutsche Telekom must assure the availability of duct capacity between MDF and street cabinet (without a one-off fee).
- Deutsche Telekom may exercise its *right of repossession* if it provides dark fibre instead.
- Competitors may also deploy microducts. Thus, the competitor may e.g. install such microducts in the fourth of the duct that is assigned to him. Generally, there is no obligation for Deutsche Telekom to grant access to microducts.
- DTAG is entitled to dispose of *one complete duct as a reserve* to guarantee quick fault clearance in case of damage to cables. On the other hand, Deutsche Telekom's claim for a second empty duct as a reserve for further network roll-out was rejected as a further fibre roll-out to the building or home would render street cabinets (and active technology deployed there) dispensable. Furthermore, Deutsche Telekom currently does not have concrete plans for such a FttH or FttB roll-out.

A.6.6 Lithuania

Legal basis

An obligation for symmetrical infrastructure (facility) sharing was established in Lithuania under the Law on Electronic Communications and is in place since 2004¹⁹. In 2005 RRT has issued detailed rules²⁰ that describe principles of sharing of infrastructure that could be used to provide electronic communications services (hereinafter – *Regulation*).

This Regulation is applicable to all legal and natural persons owning infrastructure which is suitable for the construction of electronic communications networks and defines a list of grounds for denial to share infrastructure. It does not specify any transparency obligation. Any provider of electronic communications networks or another person controlling the relevant infrastructure should permit, on non-discriminatory terms, the sharing of the existing electronic communications infrastructure as well as of other relevant pipelines, cable ducts, collectors, towers, masts, buildings and other facilities or installation of electronic communications infrastructure where this is cost efficient and does not require significant additional work²¹.

Availability

The largest owner of the duct infrastructure used for electronic communications networks in Lithuania is the incumbent TEO LT, AB and it is the only operator having public commercial offer for infrastructure sharing services (including access to the ducts, antenna sites, etc.) since 2005. Among other duct access providers there are ISPs, Cable TV operators, providers of Dark fiber, and utilities.

Duct access is a workable service in Lithuania since early 2005. According to RRT in 2009 Q1, every second operator in Lithuania used duct access services (78 of 160 electronic network and service providers). TEO LT, AB, does not distinguish access to ducts whether it is before MDF, between MDF and street cabinet, or beyond street cabinet.

In order to obtain duct access operators are required to provide a printed map indicating the duct routes which they intend to share. An electronic map indicating duct routes is not available. Operators can obtain information on duct routes from municipalities. Technical analysis is carried out by the incumbent in order to find out whether it is possible to lease a duct or not²².

¹⁹ http://www3.lrs.lt/pls/inter2/dokpaieska.showdoc_l?p_id=242679

²⁰ Only in lithuanian: Elektroninių ryšių infrastruktūros įrengimo ir naudojimo taisyklės
http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_l?p_id=344388

²¹ Law on Electronic Communications, Article 39.

²² Charges for technical analysis services is: 162 EUR/km for ducts up to 1 km; 0,162 EUR/m for ducts in excess of 1 km (excl. VAT). After last cost review in 2008, charge was increased from 122 EUR/km to 162 EUR/km

Price regulation

Prices of access to infrastructure (one-off charges and periodical charges) are regulated according to provisions of Regulation, but not by obligations imposed on SMP. Regulation applies to all infrastructure providers (not only to particular operators designated as having SMP in a particular market susceptible to ex-ante regulation). According to Regulation charges for technical analysis services (usually it is one-off charge) should be cost based, but RRT a priori has not set a cost accounting and a cost valuation method. A charge for technical analysis services should be published publicly. RRT, by its own initiative, may require changing the charge for technical analysis services if it does not represent cost. Other charges should be commercially negotiated. But if parties do not agree on charges, RRT when solving a dispute may set a reasonable charge. Decision of RRT would be based on information about cost directly or indirectly available to RRT. According to current Regulation, the ruling of RRT would apply to parties having a dispute, but not to all parties already leasing (or planning to lease) infrastructure

Costs

The charge for technical analysis according to *Regulation* should be cost based. Costs are calculated by TEO LT, AB according to FDC+HCA methodology.

One off charge cover: application analysis cost, technical analysis (transportation to ducts, analysis of free space in ducts) cost, cost related with preparation of duct schemes, cost related with provisions of documentation to lessee, return on investment (ROI).

Monthly fees for shared duct cover depreciation of ducts, billing cost, maintenance cost, common cost, customer care cost, ROI²³. Once a year any operator (not only TEO LT, AB, but any operator providing services) has a right to review charges if cost have changed²⁴. According to the Regulation, in case the parties have not agreed on charges and the dispute was brought to RRT to clarify the dispute, RRT may set a reasonable charge for infrastructure services.²⁵

²³ Monthly fee from the public offer is ~30 EUR/month per 1 km of the ducts (excl. VAT). Cost by TEO LT, AB, are calculated according to FDC+HCA methodology.

²⁴ Last review by TEO LT, AB, was done in 2008 and price increased from 25 to 30 EUR/month per 1 km of the ducts.

²⁵ Prices of access to infrastructure are regulated according to national legislation (secondary legislation) for infrastructure sharing, but not by obligations imposed on SMP. This regulation applies to all infrastructure providers (not only to particular operators designated as having SMP in a particular market susceptible to ex-ante regulation). According to national legislation charges for technical analysis services (usually it is one-off charge) should be cost based, but RRT a priori has not set a cost accounting and a cost valuation method. RRT may require changing the charge for technical analysis services if it does not represent cost. Other charges should be commercially negotiated. But if parties do not agree on charges, RRT when solving a dispute may set a reasonable charge. Decision of RRT would be based on information about cost directly or indirectly available to RRT. According to current regulation, the ruling of RRT would apply to parties having a dispute, but not to all parties already leasing (or planning to lease) infrastructure.

A.6.7 Norway

Duct Access

In NPT's decision for market 4, duct access is included as part of the obligation of offering co-location. According to our decision, co-location (hereunder space in ducts to requesting parties) shall be given on reasonable request, non-discriminatory terms, and to prices based on the principle of cost orientation. However, no details are given in our decision regarding sizes of ducts.

A.6.8 Portugal

Access to information within the duct reference offer

The decision of the Portuguese NRA of July 2004 which set out the minimum requisites for a reference offer of access to ducts included an obligation on the incumbent to build and maintain a database on ducts and associated infra-structure to be accessed by the beneficiaries of this reference offer, which came into force in June 2006.

In subsequent decisions, it was established that should be make available information comprised in the database regarding ducts and associated infrastructure and respective availability at an Extranet page, with the respective price oriented to costs (mainly related to IT updates)²⁶. A key principle is that only those incremental costs arising as a result of the obligation imposed on the incumbent to develop a database for access by the beneficiaries of this offer shall be considered relevant, i.e., any costs incurred in the absence of the imposition of the obligation concerned, should not, *a priori*, be accepted for the purpose of setting the price of the database access service²⁷.

The accepted criteria of allocation of annual costs resulted in an annual price per region²⁸ and per beneficiary, regardless of the number of consultations or the number of ducts used, provided that the price is based on the incremental cost of providing the database service.

In 2005, the incumbent stated that it did not have information with respect to duct occupation, whereby a survey was necessary in all duct segments, equivalent to the opening of more

26 Following a sufficient detail and breakdown of the cost categories, clearly identification of the additional costs that arose as a result of the obligation to provide access to the database and estimation for the total annual cost for the provision of this access for the coming years, taking into account the depreciation considered for CAPEX (the CAPEX depreciation period adopted by the incumbent is 10 years for human capital (labour) and 3 years for the IT systems);

27 Therefore no regard should be given to costs connected to: (a) local surveys needed for the provision of information on conduits; (b) updating records; or (c) the acquisition of cartographic information, as they are already incurred by the incumbent and used for other purposes.

28 Grouping the regions („Districts“) on the basis of duct kilometres existing in each (four groups of regions).

than 250.000 manholes, and the expected duration of this action would be three years²⁹. The work started in 2006, with the main urban centres, and it is not yet concluded.

Sharing of infrastructure

A Decree-Law, published in May of 2009, included the definition of the framework that applies to the development of and investment in NGA, such as an effective and non-discriminatory access to (all) ducts and other infrastructures – suitable for the accommodation of electronic communications networks – , regardless of the respective owner³⁰, the provision for technical standards on infrastructures for telecommunications in housing developments, urban settlements and concentrations of buildings, and the adoption of solutions aimed at eliminating or reducing vertical barriers to the roll out of fibre optics, so as to prevent the first operator from monopolizing the access to buildings.

This Decree-Law also sets out the system's general principles, namely the principles of competition, open access to present and future infrastructures, non-discrimination, effectiveness and transparency (e.g., by the use of harmonised procedures).

The access to infrastructures must be ensured in equal, transparent and non-discriminatory conditions, subject to cost-orientated remuneration conditions.

In parallel, a centralised information system (SIC) is established, containing data of infrastructures held by public bodies and by operators. This system is deemed fundamental for an open and effective access³¹. Through it will be possible to access information on procedures and conditions for the allocation of rights of way, information on advertisements of construction of new ducts and other infrastructures, comprehensive and geo-referenced information on all infrastructures, held by public bodies or by electronic communications companies, and information on procedures and conditions that apply to the access to and use of each of the referred infrastructures. It shall also allow the NRA to ensure a close and effective enforcement of obligations provided in the Decree-Law.

A specific chapter defines, for the first time, the legal regime that applies to telecommunications infrastructures in housing developments, urban settlements and concentrations of buildings. The NRA is required to issue technical standards on the design and set up of these infrastructures, as previously done for infrastructures for telecommunications in buildings

29 Including the adaptation of existing IT systems for the provision of the record information and, most important, field survey to compile information and update records of the GIS in order to provide information on the occupation of the ducts and with the identification and characterisation of the cable or cables installed in each hole of the duct/sub-duct.

30 This law determines that the incumbent (concessionary of the telecommunications public service) remains subject to the stricter rules coming from the Electronic Communications Law and measures adopted by the NRA. Also, private networks of holders of sovereign power, of the Ministry for National Defence, of security, emergency and civil protection forces and services, are not covered by this Decree-Law, on account of their special nature and purpose.

31 As it may be a great help in the planning of other networks and in the scope of territorial planning.

(ITED). The compulsory set up of fibre optics in the scope of the ITED has been laid down, in addition to that of copper and coaxial cable, which has been compulsory so far.

Rules have been laid down not only to promote the set up of fibre optics in buildings but also to avoid monopolization of ITED infrastructures by the first operator, by imposing sharing of the new (or upgraded) infra-structure within the building. The first operator to reach a (already built³²) building has to install at least two fibres per home (apartment) and associated infra-structure to be shared by other operators (e.g. vertical infra-structure and ODF).

A.6.9 Spain

Remedies imposed

The scope of the wholesale market 4 as analyzed by CMT includes unbundling of the copper loop and subloops.

However, civil works infrastructure are considered associated resources and thus obligations can be imposed on them. As a result CMT imposed the following remedies to Telefonica:

- To meet reasonable requests for access to infrastructure resources.
 - o Ancillary services such as collocation in FTTH exchanges must be provided as well.
 - o When technical barriers arise, Telefonica must offer alternatives (including dark fibre rental).
- Prices are regulated (cost oriented), and entail CMT approval.
- Transparency in access conditions: Telefonica is obliged to provide information on civil infrastructures to facilitate operator's deployment plans:
 - o Reference offer, including technical specifications (rules about space usage in ducts, criteria to determine space availability), procedures, provision timings and prices associated to the wholesale service provision.
 - o Technical and physical characteristics of the infrastructures associated to exchanges, including space availability.
 - o Information about Telefonica FTTH deployment plans: optical nodes and its associated coverage area.
- Non discrimination. Telefonica must communicate the following information to CMT:

32 For new buildings, the same rule applies, but the responsible for the installation of infra-structure and cabling is the owner.

- Quality parameters, quarterly provided (for both wholesale and equivalent self-supply activities).
- Agreements reached between interested parties.

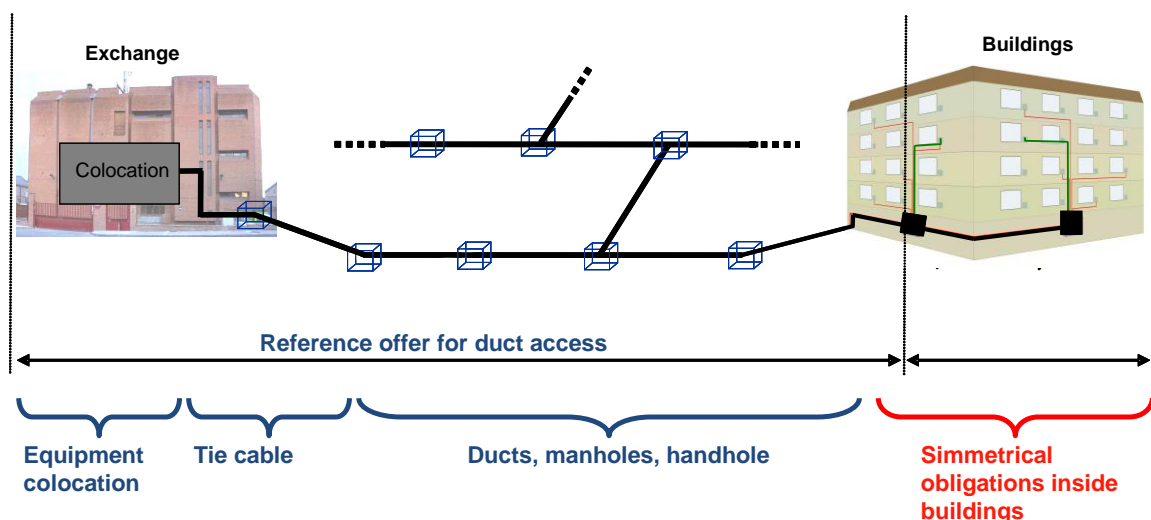
Reference offer

Telefonica published a reference offer in march 2009 which was revised by CMT November 2009, which included the following aspects:

- On-line information system providing cartographic maps with graphic representations of ducts, manholes, handholes and poles.
- Procedures and information systems to request information about space availability in infrastructures.
- Procedures and information systems to request effective occupation of infrastructures.
- Technical specifications (rules about space usage in ducts, space availability criteria).
- Associated SLA and prices.

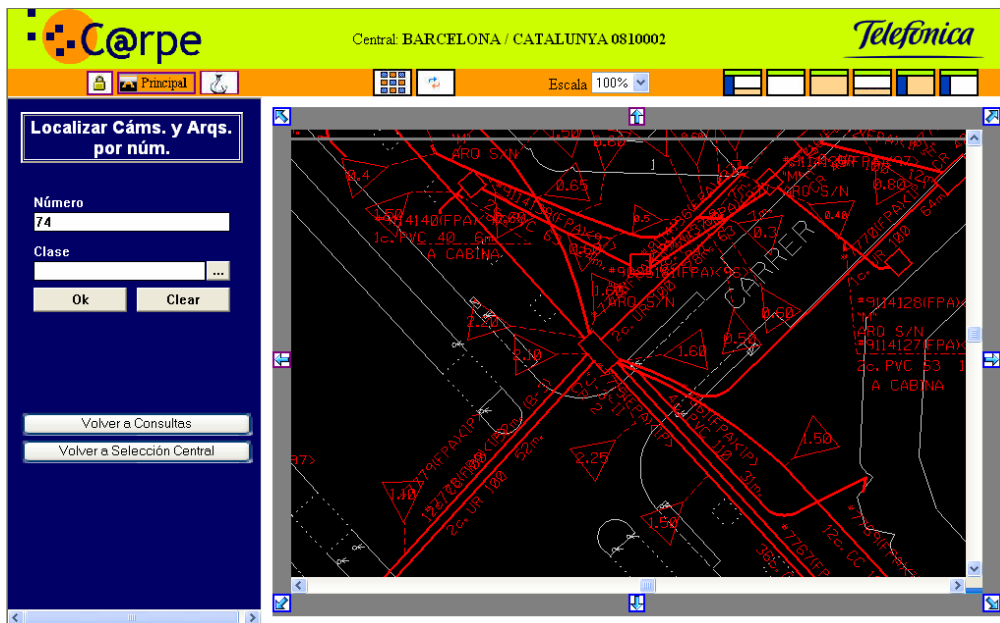
Scope of the reference offer

Ducts subject to the access obligation are those located in urban areas; they can be used to deploy any infrastructure related to NGA, and that includes optical fibre and coaxial cables, but excludes copper pairs. They can also be used to connect base stations of mobile operators.



Provision of information on infrastructures

Telefonica has deployed information systems where operators have on-line access to graphic representations of ducts, manholes, handholes and poles. Thus operators can identify infrastructure elements and generate occupation requests.



Service level agreements

The wholesale service is subject to the following SLA:

Phase	Max. period (days)
Operator occupation request	To
Operator confirms	2
Occupation request validated by Telefonica	10
Proposal of date to carry out a joint on-site survey	10
Fulfilment of joint on-site survey	10
Operator provides to Telefonica technical plan with details agreed in joint survey	Not defined
Telefonica confirms technical plan	5
Operator holds occupation rights	6 months

Engineering rules

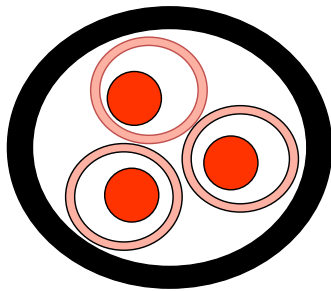
Subducting is mandatory. Subducts are considered the occupation unit, i.e. only whole subduct is provided to operators. Fibre from different operators can not share the same duct or subduct.

Alternative subducting methods based on flexible textile materials are admitted when space availability is limited.

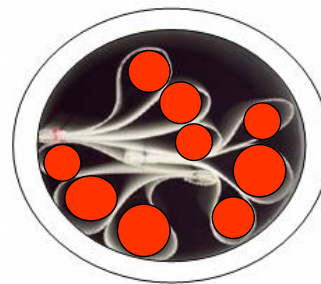
The maximum usable section in ducts or subducts is established in 40%.

Criteria to determine availability of space has been defined. Telefonica has the right to reserve two subducts (eventually only one or none in sections close to buildings) for universal service and maintenance tasks.

Procedures have been defined to intercept and occupy chambers: opening chambers, installing cables and passive elements, drilling chamber walls, etc.



Subducting with rigid tubes.



Subducting with flexible textile solutions.

Alternative solutions

When routes are saturated, Telefonica must provide alternative routes that are end-to-end equivalent to the initially requested. Such situations can not cause delays in the provision of access to Telefonica's infrastructures.

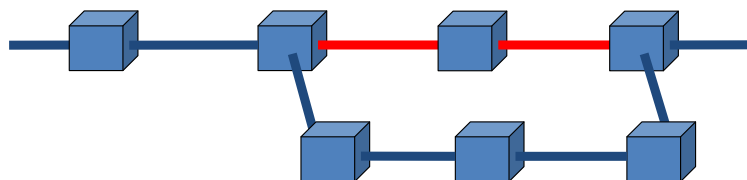


Figure: Provision of alternative route

When alternative routes are unreasonable (excessive length), operators can request the provision of dark fibre.

Collocation and tie cable

The reference offer includes procedures for the provision of tie cable to connect the optical equipment installed by operators in Telefonica's exchanges with the networks deployed in the street infrastructures.

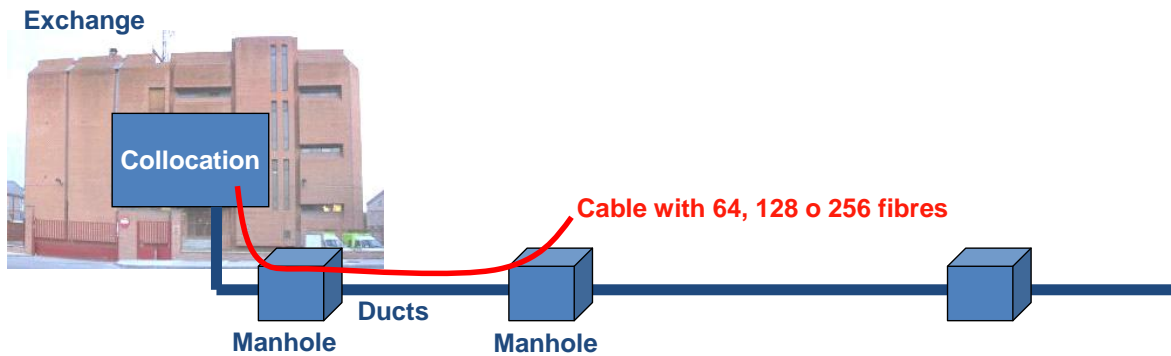


Figure: Collocation an tie cable

A.6.10 Switzerland

Legal basis

According to the Swiss Telecommunications Act, an SMP operator must provide access to ducts if capacity is available. Furthermore, an SMP operator must enable access to an online system providing information concerning the location of ducts and chambers and free capacity in ducts if this is known.

Initial reference offer

Swisscom, the incumbent operator in Switzerland, published an reference offer for access to ducts³³ in 2007 following the entry into force of the above-mentioned Telecommunications Act. This included access to ducts constructed before 2007 subject to the condition of assessment of market dominance for a given route within the scope of the feasibility analysis in the individual case. The offer defined criteria to determine space availability, technical specifications and the charges per meter of cable per month (including chambers) and charges for related service procedures. The following services were offered on a time basis with a related hourly rate: feasibility analysis (assessment of available capacity, tender for project planning; within 15 days), project planning (information to feed the cable into the tube: where, how, ...), service assurance and various service fulfilment procedures. Furthermore Swisscom made available an online system presenting cartographic maps and identifying the location of ducts and chambers, but without specifying available capacity.

³³ Only available in German:
<http://www.swisscom.ch/ws/products/FMGProdukte/KK+FMG/index.htm>

Revised reference offer

Following legal challenges from alternative operators, the Swiss Regulatory Authority (ComCom) carried out a market analysis and revised the Swisscom offer^{34 35}.

In the market analysis, ComCom found that Swisscom has SMP in the “market for Swisscom ducts” and must therefore provide access to all ducts subject to available capacity. The main arguments for this finding were:

- There are no real substitutes with comparable characteristics
- All operators are dependent on Swisscom’s net topology and Swisscom’s exchanges are only accessible via Swisscom ducts
- Swisscom is the only owner of a country-wide duct network which reaches almost all buildings in the whole country
- The high cost of civil works for changing from one duct system to another
- Local or punctual duct alternatives cannot discipline Swisscom’s market behaviour.

The NRA imposed cost oriented prices for the year 2009 as follows:

- Monthly charge per meter cable (including chambers): €0.135
- Feasibility analysis: €204 per case
- Project planning: €102 per hour
- Service assurance: €92 per hour
- Service fulfilment procedures: €102 per hour

Furthermore, the NRA imposed the obligation to provide online access to the same information and databases regarding the location of ducts / chambers and available capacity as are available to Swisscom for its own purposes. This online access must be provided at cost-oriented prices by the end of 2010 at the latest and this will replace the feasibility analysis.

Other topics such as criteria to determine space availability, SLAs or dark fibre as an alternative to occupied ducts were not the subject of a legal challenge and the NRA could therefore not intervene.

³⁴ Only available in German: <http://www.comcom.admin.ch/themen/00500/index.html?lang=de>

³⁵ Note: according to the Swiss *ex post* regime, the NRA can only intervene in the case of legal challenges brought by other operators.

A.7 Access to Dark Fibre

A.7.1 Croatia

On the basis of the conducted analysis of market No. 4, it is concluded that SMP operator must lease dark fibre to the operator if duct access is not possible due to the technically or physically limitations of free space. Similar to duct access, access to dark fibre is an annex service (backhaul) to unbundling at the street cabinet (FttC solutions).

In relation to the obligation imposed on SMP operator as part of the obligation of access and concerning the provision of the service of leasing of dark fibre, lay down conditions, time limits and prices of the service of leasing of dark fibre in the reference offer for unbundled access to the local loop and related facilities within 90 days from the receipt of a reasonable request. The NRA may, in a special procedure, amend the prices and conditions for the provision of the service if it does not find them reasonable and justified.

A.7.2 Germany

Furthermore, BNetzA specified in its decision as of December 4 2009 the conditions provide access to dark fibre. Deutsche Telekom is obliged to provide duct access if duct access is not possible due to limitations of free space. Similar to duct access, access to dark fibre is an annex service to unbundling at the street cabinet.

- Competitors are granted access to one fibre pair per DSLAM between MDF and street cabinet.
- Deutsche Telekom is entitled to a “fibre reserve” in order to be able to guarantee quick fault clearance. The size of this reserve depends on the number of optical fibres (ranging from 2 – 10 fibres as reserve; 2 if ≤ 24 fibres / 10 if ≥ 133 fibres).
- Generally, Deutsche Telekom is not obliged to lay additional fibres. No scarcity is assumed if Deutsche Telekom has deployed microducts between MDF and street cabinets into which fibres can be installed. BNetzA reasoned that a major reason for deploying such microducts is the possibility to easily increase capacities at a later stage.
- Competitors may use the dark fibre not only to provide retail services but also for the provision of wholesale services.

A.7.3 Norway

In Norway, the incumbent is obliged to grant access to dark fibre (on reasonable request). Dark fibre is included in (old) market 14 (in Norway, defined as leased lines with capacities

above 8 Mbit/s). There is no direct price regulation of this market, but access shall be given on non-discriminatory terms. Also, the incumbent is obliged to publish a reference offer including prices, terms, technical descriptions and SLAs.