# Network transformation outlook 2020-2025

Date        **22/02/2021**
Sensitivity   **Unrestricted**

proXimus

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# 1. **Background and Scope of the present document**

This document is an update of the document "Network transformation outlook 2019-2024" and has been elaborated to answer the request for information of the BIPT as formulated in "het besluit van de conferentie van regulatoren voor de elektronische communicatiesector van 29 juni 2018 met betrekking tot de analyse van de markten voor breedband en televisieomroep" and in "het besluit van de Raad van het BIPT van 13 december 2019 met betrekking tot de analyse van de markt voor hoogwaardige toegang".

The present document has been constituted to Proximus' best knowledge at present of the future evolutions of its fixed networks taken into account that several matters discussed in the present document are not covered by detailed or final decisions of the management and/or Board of Directors.

The present document contains the relevant information to what transformations in Proximus' fixed network will take place in the coming 5 years that will or might have an impact on the existing wholesale services and wholesale access points.

Most statements in the present document constitute forward-looking statements. These statements may include, without limitation, statements concerning future technological evolutions, decisions and timelines, and statements preceded by, followed by or including the words "believes", "expects", "anticipates" or similar expressions. These forward-looking statements rely on a number of assumptions concerning future events and evolutions and are subject to uncertainties and other factors, many of which are outside our control that could cause actual evolutions to differ materially from such statements.

Data and information in the present document may be subject to re-evaluation, evolution and changes. Proximus cannot guarantee that this information is complete or that no new information will become available with an impact in the coming 5 years.

Proximus cannot be held liable for any mistake, omission or any other short coming of the present information, which has been provided based on our best knowledge and in good faith.

This document doesn't constitute any binding offer from Proximus and doesn't contain any commitment from Proximus.

This document and the information within are made independently of any form of appeal, present and future, against a decision or a regulatory requirement imposed to Proximus.

## 2. The Proximus Mantra program

Proximus' Mantra program (called "Move to All IP program" in previous years), in this document referred to as "Mantra", aims at adapting and transforming the fixed network of Proximus to the global technological evolution:

- Evolution of the Fixed Voice network and Voice Service Platforms.

- Evolution of network technologies (ATM/SDH, Ethernet) and anticipation of the end of life of multiple legacy technologies.

- Invest in network simplification to reduce OPEX and increase operational efficiency.

The Mantra network transformation process is being carried out in two phases:

- The first phase concerned the building of an MPLS & IP-based network and the porting/implementation of the Proximus product portfolio (retail and wholesale) on this infrastructure.

- In the second phase, the legacy network technologies are subject to consolidation and phasing out in view of optimizing the network infrastructure and deal with the fact that legacy technologies have become obsolete and without vendor support.

The first phase was divided into four steps:

- Deployment of an IP-based access infrastructure based on FTTC and VDSL2.

- Deployment of an MPLS & IP-based aggregation and core network. The current deployed MPLS & IP-based aggregation/core network supports bandwidths up to 10 Gbps and provides the reliability needed for future proof services. The current aggregation/core networks are being renewed to cope with the continuously increasing bandwidth needs up to 100 Gbps and whose roll-out started mid 2018 with the target to have finished it in S2 2021.

- Deployment of the IMS platform for voice services.

- Porting most of the Proximus service portfolio on the MPLS & IP network. This entails both the retail and the wholesale portfolio of Proximus.

In line with our present expectations, the second phase includes all initiatives aimed at consolidating the customer installed base on the MPLS & IP infrastructure and at reducing the operational complexity of managing several network infrastructures in parallel (one per service).

- Phasing out of access legacy technologies (Leased Lines in all different flavours, X.25, PDH & SDH) and traffic transition to the MPLS & IP-based infrastructure.

- Phasing out of core legacy technologies (ATM, PDH & SDH, PSTN, ISDN, …) and traffic transition to the MPLS & IP-based infrastructure.

Fig. 1 below gives an overview of "the" Network Simplification program from which parts are already started or even already finalized.
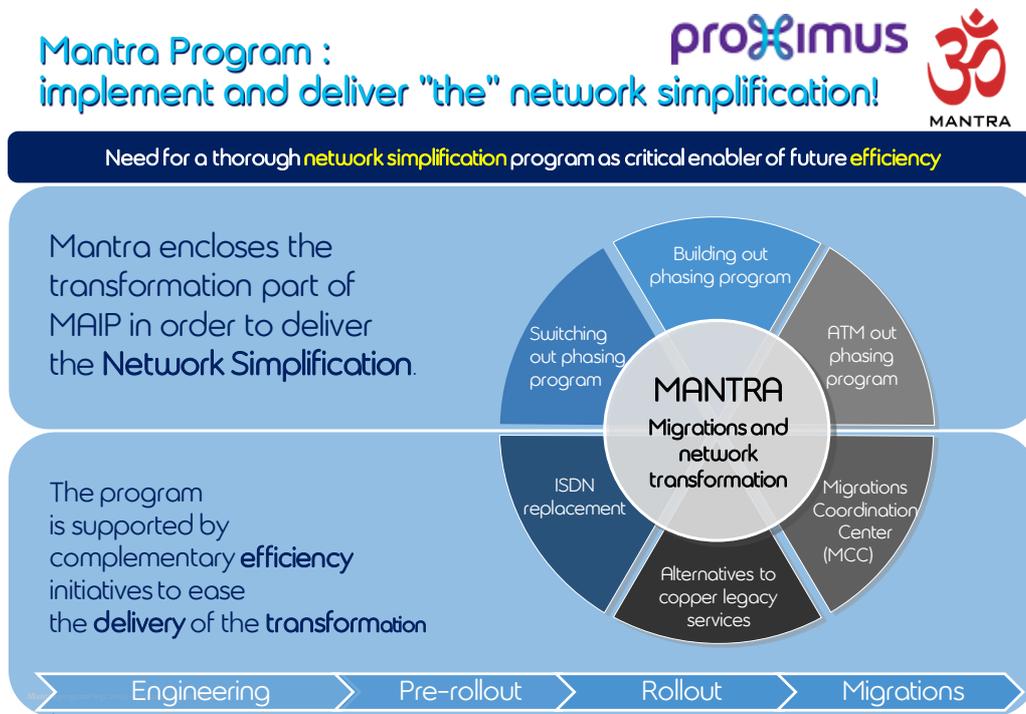


Figure 1: Network Simplification

The Mantra program has impact on the Wholesale services currently offered by Proximus. Below we summarize the most important impacts:

- **Broadband Access services**: The ATM-based Bitstream ADSL(2+) and SDSL services have been transformed to Ethernet-based Bitstream ADSL(2+) and SDSL services in order to meet the global technological evolution towards Ethernet. Since the beginning of 2021, the SDSL platform has been outphased completely.

- ATM is now fully phased out and replaced by Ethernet as uniform medium for access technologies such as ADSL, ADSL2+ and VDSL2.

- **Data and Capacity services**: migration from BILAN and Leased Lines to Ethernet based services.

- **Voice Interconnect**: as the complete voice network (except remaining legacy ISDN-BAs) has now been migrated to an IMS based infrastructure, the current TDM interconnection model between Proximus and third party operators is evolving to an IP Interconnect model.

- **Local Loop Unbundling services**: as additional LEX buildings will be closed, the colocation and services delivered in and from these buildings will have to be terminated and/or migrated to alternative offers.

The Mantra program has a different impact on each of the wholesale customers. In that perspective, Proximus holds, since 2010, recurrent meetings with the wholesale customers in order to:

- Inform the wholesale customers about the products that will be out-phased and about the future products.

- Give them guidance on possibilities for evolution scenarios.

- Discuss with them the lists of impacted lines and create migration plans for these.

The removal of the older data networks (ATM) and the legacy telephone exchanges (Nokia [1] and Siemens) were key enablers to sell off a number of large technical buildings in city centres as described in chapter 6 "Building Outphasing".

However, the long term ambition of Proximus is to cover the centre of cities and communes with fiber (see chapter 3), to make in the non-fiberized areas great parts of the copper (feeder) network redundant and to further dispose parts of the total technical surface area mainly located in smaller buildings from mid-2019 onwards. This resulted in the decision to start the related works for "Mantra+" from 2017 onwards with a pilot of 10 buildings, for which the outphasing has been finalized, and the notification of 64 Mantra+ buildings (which is now reduced to 27 buildings - see chapter 6). At that stage, the technology will be located mainly in existing street cabinets, supplemented with newly designed small containers called Optimus containers. Some local nets will not be equipped with an Optimus container but with an OVD (Optische Verdeler), a passive street cabinet that patches the optical fibers to 1 or more neighbouring LEXes.

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[1] Nokia acquired Alcatel-Lucent in April 2015.

# 3. Broadband Access Evolution

Preliminary statements in this chapter concern the technologies and services in general in Belgium. Specific circumstances may exist in outphased buildings as described in Chapter 6.

Proximus continues to deploy Fibre-to-the-Curb in selected areas allowing to extend the VDSL2 service coverage.

The impact of this evolution on wholesale access services is twofold:

1. The LEX based unbundling model becomes obsolete (which is confirmed by the fact that certain MDF sites are already closed down or are notified for closure).

2. The Bitstream ADSL(2+)/SDSL over ATM reference offer became obsolete and evolved to:

   a. either a Bitstream access service for VDSL2 connectivity which is always Ethernet based,

   b. or a Bitstream over Ethernet service for ADSL(2+).

ADSL(2+) will be gradually outphased in the copper distribution areas served by ROPs with all Living Units connectable in VDSL2 as an enabler to activate vectoring also in the downstream frequency bands between 552 kHz and 2,2 MHz. The opening of the VDSL2 zones 6 and 7 triggered a list of additional homogenizable ROPs.

## 3.1 Broadway

VDSL2 coverage

Proximus announced its Broadway plans publicly in 2004 with an initial target coverage for VDSL2 of 46%. This coverage target was progressively increased, so that Proximus has reached by end 2020 an effective service coverage for VDSL2 of 96,9%[2].

Information on a more detailed basis regarding availability is provided if, where and to the extent relevant in the context of the existing wholesale access services.

The coverage as well as the attainable speeds with VDSL2 depend on attenuation and distance. For the current attenuation- and distance limits, please refer to the Bitstream xDSL offer published on Proximus' web site.

VDSL2 speeds

In 2010, the use of spectrum for VDSL2 has been increased to 17 MHz allowing attainable provisioning speed up to 30 Mbps downstream & up to 10 Mbps upstream on legacy and vector-friendly VDSL2 lines.

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[2] The current VDSL2 provisioning speeds range from 70 Mbps (vectoring zone 1) downstream to 8 Mbps (vectoring zone 7) and can increase through the DLM-process from up to 16,5 Mbps (in legacy zones 4 and 5), 30 Mbps in vectoring zones 6 & 7 to up to 100 Mbps (in vectoring zone 1).

Since 2012, Proximus also applies the DLM (Dynamic Line Management) process to the VDSL2 lines, boosting part of its park of legacy and vector-friendly VDSL2-lines to up to 70 Mbps downstream speeds. The DLM allows part of the legacy and vector-friendly VDSL2 lines to benefit from higher bit rates than expected according to the provisioning rules based on loop length and attenuation, without increasing significantly the risk for transmission errors or instabilities.

Since 2014, Proximus also applies the DLM process to increase upstream speeds up to 10 Mbps on legacy and vector-friendly VDSL2-lines.

In collaboration with its VDSL2 equipment manufacturers Proximus has now upgraded its VDSL2 network with the roll-out of a new technology called vectoring. Based on new VDSL2 ISAM cards, downstream vectoring allows internet speeds up to 70 Mbps by neutralizing interferences between copper pairs lying in the same cable. DLM further boosts part of this park of vectored VDSL2 lines to up to 100 Mbps.

Since 2015, Proximus also implemented upstream vectoring which increases the upstream speed on vectored VDSL2-lines to up to 20 Mbps. The upstream speed was further increased to up to 40 Mbps in 2017.

From mid-2017 onwards, Proximus started gradually with the activation of vectoring in the frequency band from 1,1 MHz to 2,2 MHz on notified ROPs without ADSL2+ services to achieve further downstream speed increases for many of the subscribers which are connected to homogenizable ROPs, meaning they serve a copper distribution area that allows all Living Units to be connected in VDSL2. Such homogenizable ROPs are being gradually closed for ADSL2+ services.

In 2018, Proximus also started gradually with the activation of vectoring in the frequency band from 552 kHz to 1,1 MHz on these notified ROPs after the removal of ADSL1 services.

On 22 November 2018, Proximus extended the VDSL2 coverage by having added the new vectoring zones 6 & 7 for ROPs on which ADSL from ROP has been activated. This allows the homogenization of additional ROPs.

From mid-2020 onwards, newly installed ROPs are equipped with new DSLAM equipment (7363 MX-6). This new equipment contains a new line card, i.e. the RDLT-G card of Nokia and consolidates all DSLAM functionalities (logic, processing, management functionalities) completely in the ROP. It will also support the future 35Mhz technology (see below). The introduction of this new DSLAM equipment is considered as a major network upgrade with the associated OLO CPE operators' roles and responsibilities. The gradual migration of the current DSLAM equipment in the existing ROPs, implying a short service interruption, is only foreseen as of 2022 at the earliest. The planning of these migrations will be communicated timely.

In the coming years, Proximus could implement solutions to further upgrade its VDSL2 network. In this respect, the following solutions might be investigated:

- Solutions that further increase downstream- and upstream speeds.
- "Long Reach" VDSL2: the potential of this standard has been technically assessed, but the business potential would require further analysis.
- VDSL2 35 MHz, currently being tested with field trials, to further increase downstream speed through the use of the spectrum to 35 MHz. VDSL2 35 MHz would be enabled on the new VDSL2 platform as described above. The large scale activation of 35 MHz is not foreseen before 2022.

Proximus will timely adapt the Bitstream xDSL reference offer with new 35 MHz VDSL2 line profiles, the impact on the UNI specification and an update of the OLO-CPE test plan in order to make sure that alternative operators can also benefit from this new 35 MHz VDSL2 technology when launched. Operators using an existing OLO CPE that may be 35 MHz compatible will have to recertify these CPEs conform the OLO-CPE test plan (that will be updated for 35 MHz VDSL2). It is important to note that the existing 17,6 MHz capable CPEs are expected to still function in 17,6 MHz VDSL2 profiles with the new MX-6 platform.

- Deployment of small nodes to reduce the copper distance between the ROP and the customers.
- FTTdp (G.fast). Although the technology potential has been confirmed meanwhile through field trials, Proximus is maximizing end-to-end fiber adoption. Therefore the business potential of this solution (which would require a sufficient scale) for fiber zones has not been confirmed yet.
- Vectoring from LEX/LDC, based on the MX-6 platform as used for ROPs (supra). Proximus currently plans to perform field tests in the 2nd half of 2021 at the earliest and start the roll-out in a subset of LEXes/LDCs as of the 1st half of 2022 at the earliest.

## 3.2    Physical Access Network Evolution

As Proximus deployed a fibre network to the vicinity of the Street Cabinet (KVD, Borne), by installing Remote Optical Platform units (ROPs) next to those Street Cabinets from which broadband- and voice services are provided, the MDF functionality in the Local Exchange (LEX) will be lesser and lesser used.

Therefore, as part of its roll-out, Proximus is able to dismantle a number of the local exchange buildings. Hence the current colocation and unbundling services at the LEX will be terminated or largely reduced, pursuant the regulatory framework as defined in the relevant regulated reference offers and the respective contracts.

In order to support the long-term target of the disappearance of the MDF functionality in the Local Exchange building (LEX), Proximus might reduce renewal investments in the copper feeder network by gradually outphasing copper feeder cables if and where they must be renewed (e.g. triggered by roadworks or cable damage).

The figure below gives an overview of the most important elements in the new access network, as well as the respective elements.
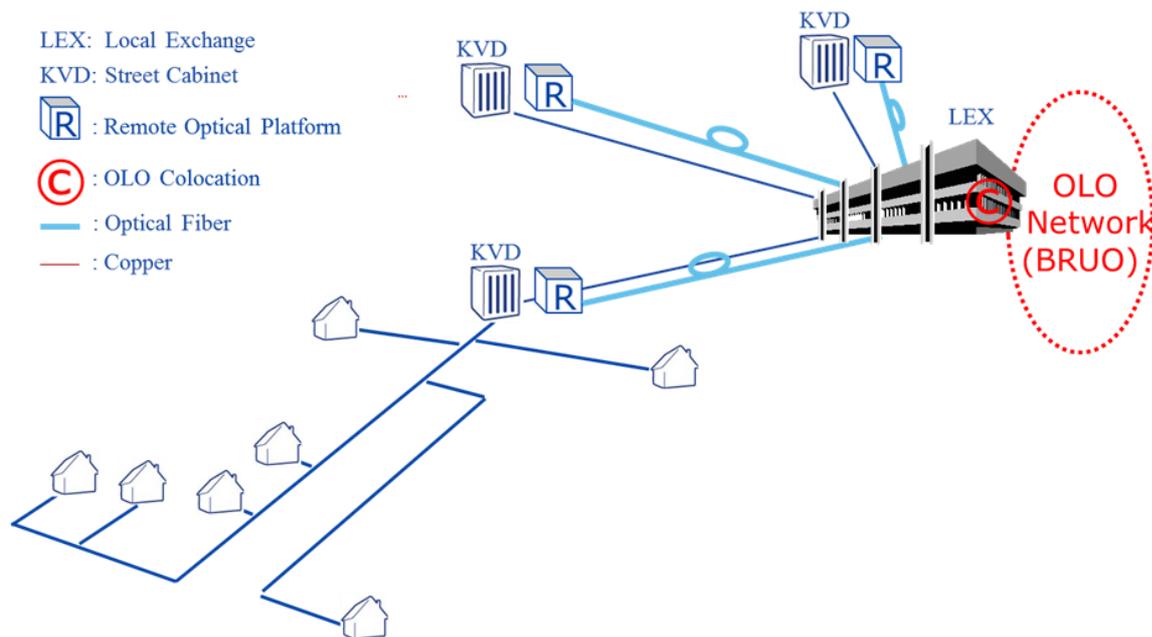
**Figure 2: Physical Access Network Evolution**

## 3.3　Wholesale Broadband VDSL2

The Bitstream VDSL2 service allows the alternative player to connect its end-users onto the Proximus network at a Proximus Service PoP using VDSL2 technology. The end-to-end transport between the end-user and the beneficiary is based on Ethernet.

<u>Impacts of the vectoring technology on the Bitstream VDSL2service</u>

The application of vectoring on the VDSL2 lines is not compatible with the delivery of ISDN services on VDSL2 lines. As a result, since 2013:

- Ordering of new Bitstream VDSL2 products on end-user lines with ISDN service is not possible anymore. Ordering Bitstream VDSL2 on another pair will remain possible: Bitstream VDSL2 without Voice or Bitstream VDSL2 with Voice on PSTN.

- Proximus finished the uncoupling of all existing configurations where both Bitstream VDSL2 and an ISDN service were offered on the same copper pair.  The ISDN service is moved on another pair, without impact on the Bitstream VDSL2 service of the end-user.

(Please refer to the Bitstream VDSL2 offer for further details)

The extension of vectoring on VDSL2 lines in the frequency bands between 552 kHz and 2,2 MHz is not compatible with the delivery of ADSL1 and ADSL2+ services from those ROPs.  As a result, from 01/07/2017 for ADSL2+ and from 01/02/2018 for ADSL1 :

- Ordering of new ADSL1 or ADSL2+ products is not possible anymore for endpoints which are located in copper distribution areas in which all Living Units can be connected in VDSL2.

Reach Extended ADSL2 services are opened on all ROPs which support "ADSL from ROP" or which have been homogenized (meaning sub 2,2 MHz vectoring has been activated).

The speed of VDSL2 lines which are not equipped with a VDSL2 CPE which is at least "vector-friendly" at the moment of the activation of vectoring on the ROP concerned will be reduced to a Fall-back speed as defined in the Bitstream VDSL2 reference offer.

The Ethernet backbone investments project (introduced in chapter 2) - which aims at gradually replacing the current Ethernet aggregation/core networks - will add a third option called "Single VLAN" to the current Bitstream VDSL2 and Bitstream Fiber GPON reference offers on top of the existing options "Shared VLAN" and "Dedicated VLAN". No plans to outphase these existing options have been developed yet. The addendum of this new third option, was submitted to the BIPT on November 23rd 2020 in order to become effective in the course of the third quarter of 2021. On February 12th, the addendum was approved by the BIPT.

## 3.4     ATM Outphasing

At the transport network level, Proximus consolidated the traffic on a common MPLS & IP-based infrastructure. Hence ATM outphasing was the most cost-effective path for the future. Proximus implemented the following strategy to accomplish this technological transformation:

- Nokia R5 Gigabit Ethernet NT cards have been installed in the R5 DSLAMs, and cover the whole of Belgium since mid-2011.

- ADSL(2+)- & SDSL traffic was mapped from ATM to the Ethernet backbone.

- Extension of Bitstream ADSL(2+) and SDSL to Ethernet transport.

- The Wholesale interconnection points on ATM level were closed and replaced by the 10 Ethernet Service Nodes.

Proximus performed with its customers the migration from ATM-based services to Ethernet-based services. Migrations have started in 2010 and Proximus now finished off-loading the ATM-network.

## 3.5     ROP-based ADSL(2+)

The ADSL(2+) traffic can be transported on the Ethernet backbone thanks to the solution based on the Gigabit Ethernet NT cards installed in the ATM-DSLAMs hosted in every central office.

In the central office of buildings to be outphased and in copper distribution areas (these are the endpoints served by one street cabinet – see figure 2) for which the copper feeder will be cut, the LEX-based ADSL(2+) solution is not sustainable. Therefore Proximus developed ROP-based ADSL(2+) solutions, based on the Nokia NDLT-G vectoring cards (which also support multi DSL) installed in the ROPs. This allows to deliver ReADSL, ADSL1 and ADSL2+ solutions, but are not adequate for SDSL, nor for ADSL(2+) lines delivered with ISDN on the same copper pair. In this context, a stop sell of ADSL-services over legacy ISDN from 2017, February 1st onwards was notified and approved.

The ROP-based ADSL(2+) solution is applied for the different flavours of retail- and wholesale ADSL(2+) services (Fast Internet Access, Explore, Carrier and Bitstream) and Proximus launched it for building outphasing nets since end 2013.

Proximus extended the usage of the ROP-based ADSL(2+) solution in all local nets from late 2015 onwards to solve issues such as saturated or damaged feeder cables, improve ADSL(2+) access speeds and for the gradual outphasing of the current ATM-DSLAM-platform.

All LEX-based ADSL(2+) services (including ADSL(2+) on BRUO-lines) must be moved to the ROP upon activation of ROP-based ADSL(2+) for that ROP.  The impact on the BRUO reference offer has been covered with the creation of a new BRUO-service "Raw Copper Type 3" for SDSL-services on BRUO-lines.

The decision to gradually activate vectoring in frequency bands below 2,2 MHz also triggered the necessity of a further roll-out of ROP-based ADSL(2+) services as a preparatory step towards it.

(Please refer to the BRUO and Bitstream xDSL offers for further details)

The LEX- and ROP-based ADSL(2+) solutions based on the Nokia NDLT-G vectoring cards were also an enabler for the End-of-life outphasing of the ATM-DSLAM-platform

## 3.6     Fiber To The Home

At the end of 2016, Proximus announced an investment of € 3 billion in the coming 10 years to accelerate the roll-out of Fiber in Belgium aiming at covering the centres of cities and communes, through deployment both on the façade of buildings and in certain sections in underground ducts. In 2020, Proximus announced a cooperation/co-investment with other partners for the fiber roll-out. The objective is to have 4.2 million homes and companies connected to fiber by end of 2028, representing a coverage of at least 70% of Belgium.
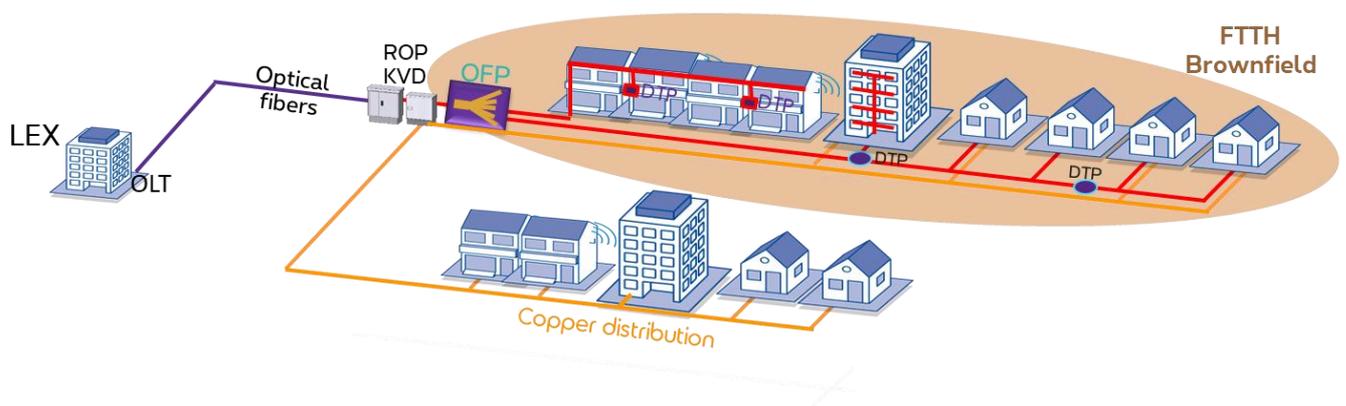


Figure 3: FTTH network

In the coming years, Proximus will fully fiberize dense and medium-dense city areas, starting with a progressive roll-out. An overview of all cities where fiber roll-out is started or announced to be started can be found on:

https://www.proximus.be/en/id_cr_fiber_cities/personal/orphans/fiber-to-your-home/the-future-comes-to-your-city.html

In such areas, migrations from copper to fiber will take place progressively following the full fiber coverage of the relevant geographic areas which will be notified for the copper plant outphasing (see also Chapter 7). Proximus also continues to deploy FTTH in industrial zonings and in new residential zonings.

In 2014, Proximus presented its first commercial wholesale FTTH offer. In November 2018, a Bitstream Fiber GPON offer was presented in line with the Broadband market decision of 29 June 2018.

Proximus notifies its wholesale fiber customers and the BIPT on the planned network extensions of the fiber deployment progressively along the project:

- Twice a year, Proximus communicates the Fiberhoods for which the construction started to the BIPT and the wholesale customers.
- A stop service of all copper based services in these Fiberhoods is communicated to the BIPT and the wholesale customers conform the timings as defined by the BIPT. An overview of all Fiberhoods for which copper outphasing is planned can be found in Chapter 7.

With the exception of high-speed digital services such as LAN Extension Solutions (BLES), Optical Network Services (ONS) and a set of bitstream services, only IP-based services will remain available in FTTH areas.

Proximus currently expects to deploy XGSPON (10Gbps) in (part of) its Fiber GPON coverage area in the forthcoming period

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# 4. Data and Capacity Services

Preliminary, statements in this chapter concern the technologies and services in general in Belgium. Specific scenarios may exist in outphased buildings as described in chapter 6.

Bandwidth demand is ever increasing in today's data networks and these same networks are evolving more and more towards Ethernet. Therefore, in the long term, Proximus anticipates the Leased Lines services based on SDH to become obsolete, as data needs will be fulfilled by another type of supply, which forms part of a different market for data services.

The following planning was established:

- Analogue Leased Lines and digital Leased Lines lower than 2 Mbps are no longer sold since 1 January 2017 ("Stop sell") and completely outphased since end 2019.

- Higher or equal to 2 Mbps Leased Lines, including partial circuits, backhaul and half links, are no longer sold since 31 December 2020 ("Stop sell")[3] with a progressive "Stop service" afterwards. Current expectations are having outphased them all by end 2023 as a prerequisite for SDH outphasing.

- The BROTSoLL offer has been extended in 2014 with a Next Generation Leased Line service. NGLL is an Ethernet (Layer2) connectivity service; based on Ethernet over MPLS technology and it can be accessed via Ethernet over copper (Ethernet in the First Mile = EFM) and Ethernet over fiber. (Please refer to the updated BROTSoLL offer for further details).

- Ethernet services (10 Mbps) and Fast Ethernet services (100 Mbps) are currently implemented on top of the SDH-network which is planned to be outphased. Fast Ethernet services (100 Mbps) can be implemented on the Ethernet backbone but the 10 Mbps Ethernet services are no longer sold since 31 December 2020 and are planned to be outphased by end 2023 as a prerequisite for the SDH-outphasing.

- For Ethernet over copper (EFM), "Stop Sell" and "Stop Service" plans are still under evaluation as it is not a future proof technology but a target date to have them all outphased is not yet decided.

- BILAN ATM/FR services were migrated to MPLS Ethernet and the public X.25 service was stopped in 2013.

[3] Except for TDM voice interconnect, see chapter 5.

# 5. Voice Interconnect Evolution

The legacy voice network was a 2-layer network which included about 180 Local Exchanges (LEX) for which hardware was installed in over 1.000 buildings which was fully phased out and replaced by IP-based solutions for PSTN-lines and PRA-lines by end 2017.

The technical solutions for this migration are based on the following elements:

- PSTN emulation via Access Gateway (AGW) as replacement for traditional PSTN services. AGWs are installed in the ROP (Remote Optical Platform) or in the central office and are controlled by an IMS platform. Figure 4 shows how it is built. PSTN lines are emulated via the voice access gateway.
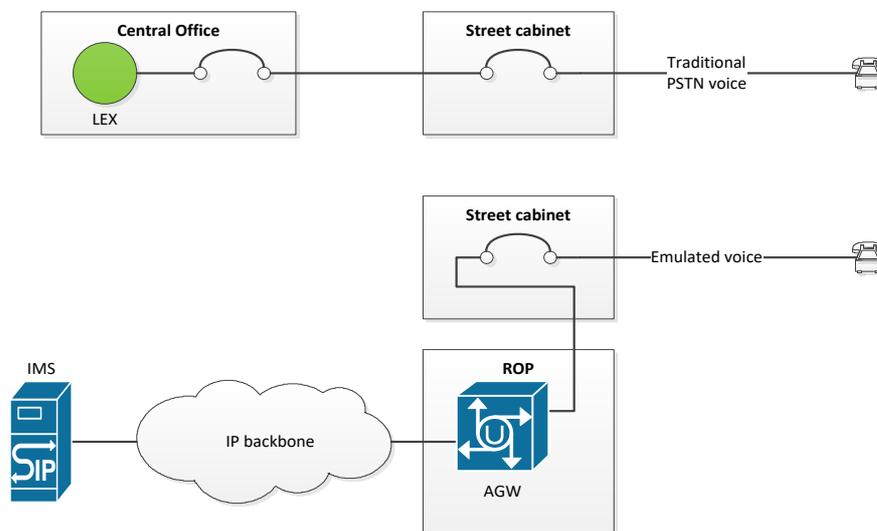


Figure 4: PSTN AGW solution

- ISDN emulation via IAD (Integrated Access Device), as a replacement for traditional ISDN-BA services. IADs are installed at the end-user & connected between the xDSL modem and the end-user ISDN device as shown in figure 5 and are controlled by an IMS platform. This solution needs a technical intervention at the customer's premises.

- An ISDN BA "Nokia S12 extend End-of-life" solution has been implemented on which ±75% of the remaining ISDN BA subscriptions have been migrated without any technical intervention at the customer's premises. A limited number of Nokia S12 Local Exchanges (LEX) remains active and S12 ISDN remote unit hardware has been installed in all central offices (except BO-nets) on which these remaining ISDN-BA lines are concentrated. A "Stop Sell" ISDN-BA from 1 January 2017 onwards (with some exceptions) has been notified to the market aiming at a gradual emptying of these platforms by end 2022. In this context, Proximus communicated on December 12th 2019 to the BIPT a stop service of xDSL services on ISDN-BA as from December 31st 2021, which was approved by the BIPT on February 6th 2020. On October 28th, 2020 Proximus announced a postponement of this stop service to September 30th 2022.
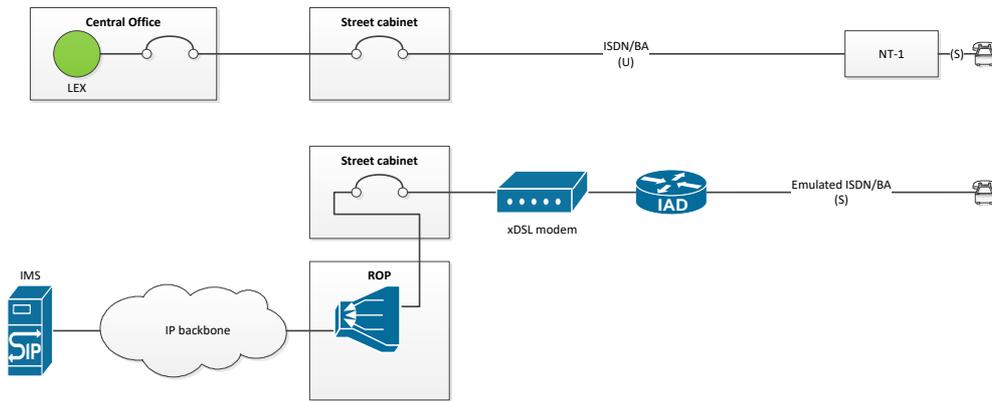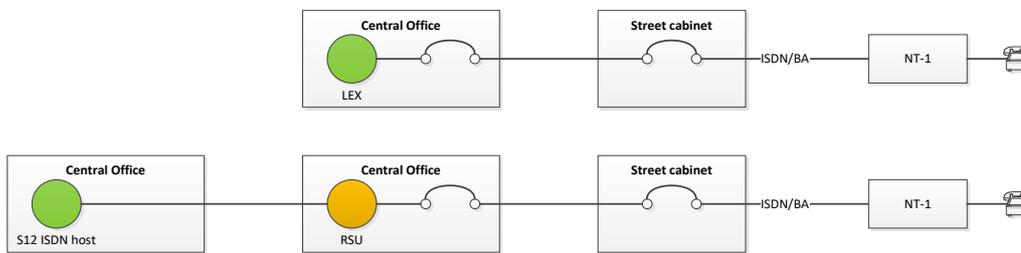
Figure 5: ISDN over IAD solution



Figure 6: ISDN/BA on S12 ISDN host via Remote Switching Unit

- ISDN-PRAs that were not replaced timely with another commercial offering have been migrated without needing a technical intervention at the customer's premises to a MGW-solution (Media Gateway) which is controlled by an IMS platform and became available in 2015.



Figure 7: ISDN/PRA via Media Gateway

- ISDN emulation via IAD (Integrated Access Device) has been developed as a replacement for traditional ISDN-PRA services These IAD-30s are installed at the end-user & connected between the Ethernet interface of a broadband service and the end-user ISDN-PABX and are controlled by an IMS platform. This solution must be implemented for ISDN-PRAs that cannot be replaced timely with another commercial offering as a prerequisite for the SDH outphasing.

- Proximus undertakes to keep CPS and CS available to alternative operators for the above-mentioned solutions. In case the underlying classic PSTN, ISDN and PRA technology disappears for the end-user because of the evolution of the Proximus network infrastructure or because of

the Proximus-initiated migration to Voice over Broadband technology, CPS and CS are not supported anymore. Proximus plans to completely stop the CS and CPS services at 31 December 2022 at the latest and will inform the alternative operators 6 months in advance of the final stop service date. The conditions determining a potential earlier stop of CS and CPS are described in the reference offer.

A gradual migration towards voice over broadband services will further reduce the use of PSTN services emulated via Access Gateway (AGW) and the long term replacement strategy of the Access Gateway will require forced migrations of remaining PSTN services as probably from 2020 onwards. Proximus started therefore in 2017 with the delivery in its packs with voice of IP Phone lines instead of emulated PSTN. Note that CPS and CS services are not supported on IP Phone lines.

Impact on BRIO and BROTSoLL IC links:

BRIO local voice services (local Terminating and local Collecting) have been fully outphased since end 2017.

A TDM MGW solution (Media Gateway) was launched in 2015.

BRIO aggregated voice services (aggregated interconnect level) have been fully migrated in 2016 and 2017 without changes of the interconnect links (OIT) as Proximus reconnected the existing interconnect links on the TDM MGW solution.

As – except remaining legacy ISDN-BA-lines - the complete legacy voice network has been migrated to an IMS based infrastructure since end-2017, the current TDM interconnection model between Proximus and third party operators is evolving to an IP Interconnect model.

Therefore an IP interconnection solution has been developed. The gradual migration from TDM to IP interconnection started in 2018 aiming at closing the TDM interconnection afterwards. Proximus foresees to have TDM interconnection outphased in the course of 2022 in order to enable the SDH outphasing by the end of 2023. Voice TDM interconnection lines will at least be sold until end of 2021. Also Mobile interconnection on TDM is foreseen to be outphased before end of 2023 as an enabler for SDH outphasing.

# 6. Building Outphasing

The Building Outphasing is an essential component of the Proximus Mantra and Mantra+ Programs. **A list of 65 Mantra buildings was initially identified** for closure between 2012 and 2021, and communicated to the market. In this initial plan, some large buildings were excluded, due to their technical complexity. The building outphasing plan has evolved to a lower number of buildings, but puts more focus on the large buildings. 21 Mantra buildings have been outphased until now and 1 building is left to be outphased (planned for 2021).

With regards to the Mantra+ Program, 74 local nets (including 10 pilot nets) were initially identified for which the main building would be emptied, of which 13 have been executed in the meantime. Due to the acceleration of the fiber roll-out as announced by Proximus in 2020 (cfr. supra), the Mantra+ planning has been updated significantly and reduced to 27 buildings still planned to be outphased until 2024.

The table 1 below summarizes the current building outphasing planning of the "Mantra" (1 building) and "Mantra+" (27 buildings) programs in the period 2021-2024. **This planning is only indicative and still subject to changes**.

Table 1: building outphasing planning of the Mantra/Mantra+ program

| End of Service Delivery | Local Net | Phase Out Year | Address, Nr | City |
|---|---|---|---|---|
| 30/06/2021 | 03DEU0 | 2021 | Terheydelaan | DEURNE |
| 30/06/2021 | 91GAV0 | 2021 | Stationsstraat 180 | ASPER |
| 30/06/2021 | 13LUM0 | 2021 | Past. Frederickxstraat, 13 | LUMMEN |
| 30/06/2021 | 60CHI0 | 2021 | Rue Reine Astrid, 5 | CHIMAY |
| 30/06/2021 | 52DEN0 | 2021 | Noordlaan, 25 | DENDERMONDE |
| 30/09/2021 | 16VER0 | 2021 | Stationstraat, 87 | VERTRIJK |
| 31/12/2021 | 57IEP0 | 2021 | Vooruitgangsstraat, 1 | IEPER |
| 28/02/2022 | 02GRI0 | 2022 | Wolvertemsesteenweg 279 | GRIMBERGEN |
| 28/02/2022 | 03BOO0 | 2022 | Antwerpsestraat, 97 | BOOM |
| 30/06/2022 | 81GEM0 | 2022 | Rue Monseigneur Heylen, 9 | GEMBLOUX |
| 31/12/2022 | 02BRA0 | 2022 | Rue Albert 1$^{er}$, 117 | BRAINE L'ALLEUD |
| 30/06/2023 | 91ZOT0 | 2023 | Meerlaan 54 | ZOTTEGEM |
| 30/06/2023 | 82DIN0 | 2023 | Rue Bribosia, 9 | DINANT |

![Proximus logo]

| End of Service Delivery | Local Net | Phase Out Year | Address, Nr | City |
|---|---|---|---|---|
| 30/06/2023 | 64LAL0 | 2023 | Rue de la Concorde, 17 | LA LOUVIERE |
| 30/06/2023 | 58KOK0 | 2023 | Koninklijke Baan 81 | KOKSIJDE |
| 30/06/2023 | 16RIL0 | 2023 | Diestsesteenweg, 259 | RILLAAR |
| 30/06/2023 | 89NEE0 | 2023 | Kanaalstraat, 7 | NEEROETEREN |
| 30/06/2023 | 60COU0 | 2023 | Avenue de la Libération, 21 | COUVIN |
| 30/06/2024 | 41ENG0 | 2024 | Rue Maréchal Foch, 2 | ENGIS |
| 30/06/2024 | 03MEE0 | 2024 | Meerlesesweg, 57 | MEER |
| 30/06/2024 | 15PUT0 | 2024 | Pachtersdreef, 24A | PUTTE |
| 30/06/2024 | 11ALK0 | 2024 | Stationsstraat, 126 | ALKEN |
| 30/06/2024 | 12BOR0 | 2024 | Koningin Astridlaan, 12 | BORGLOON |
| 30/06/2024 | 14BAL0 | 2024 | Rijsberg, 39 | BALEN |
| 30/06/2024 | 89GKZ0 | 2024 | Terboekt, 89 | GENK |
| 30/06/2024 | 65JUR0 | 2024 | Rue du Moustier | JURBISE |
| 30/06/2024 | 10BEA0 | 2024 | Route de Beauvechain, 27 | TOURINNES-LA-GROSSE |
| 30/06/2024 | 71FOS0 | 2024 | Rue des Remparts, 5 | FOSSES-LA-VILLE |

Note that those dates are end of services delivery dates for **all** lines; which of course requires a progressive migration to get them all migrated in due time. Building outphasing automatically implies that the outphasing of legacy ISDN lines is performed simultaneously or beforehand.

Impact on co-location and LLU services:

- The first general rule is that the MDF and the copper feeding network are out-phased completely. In this standard case, co-location (including co-mingling) and LLU services are no more possible.

- In four local nets (02EUR0, 83CIN0, 02BOS0 and 87VER0)[5] a new Mini-MDF function was created to serve a *limited* number of customers who remain connected on copper pairs. For this limited

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[5]   The Mini-MDF function will not be created for Mantra+-buildings.

number of lines, LLU remains possible. Proximus communicated to the Operators the list of Street Cabinets (KVDs) and Direct Feeds eligible for connection to the Mini-MDF in these specific LEXs.

In all cases the MDF of the current buildings, that are or will be sold, will have to be freed up completely.

Impact of the outphasing of the Ethernet Service PoPs 03CEN0 and 91GKK0

- These Service PoPs serve as a connection point for Proximus sited OLO Access Lines to collect Bitstream xDSL traffic and Proximus sited Aggregation Point Access Lines to collect NGLL traffic.
- These Service Nodes moved to neighbouring villages:
    - 03CEN ("Antwerpen-Centrum") moved to 03WOM ("Wommelgem");
    - 91GKK ("Gent – Keizer Karel") moved to 91WON ("Wondelgem").

Colocation is available in both new Service Nodes and Proximus developed in 2017 the "Distant Intro offer" which allows to reconnect Proximus sited OLO Access Lines and Aggregation Point Access Lines (OAL & APAL) from these moved Service PoPs for OLOs who had not yet the possibility to order Proximus sited OAL/APAL ports from 03WOM and/or 91WON due to the absence of OLO-fiber there.

Impact of the outphasing of the building in the local net 02STR0

- The Ethernet Service PoP 02STR remains in service.

Impact of the outphasing of buildings with an Area Access Point (AAP)

- Operators who want to keep the TDM voice interconnection solution will be offered the possibility to introduce the impacted interconnection links via an Area Access Point in a different Area.

Impact on other OLO services:

- The following services will have to be migrated to alternative solutions before the end of service delivery date of the outphased building where they are currently in service:

Table 2: Services to be migrated to alternative solutions.

| Product type |
| --- |
| Co-location and co-mingling in current buildings |
| Explore EFM (or E-line EFM or NGLL EFM) |
| BRUO (RC and SP) ([a]) |
| Leased Lines equal to or greater than 2 Mbps |
| ONS 10 Mbps |

([a]) Not applicable in copper zones for OLOs with a valid contract for co-mingling in the new Atropos room.

- As mentioned in different chapters higher in this document, certain Product types are or will be the subject of a global outphasing with "Stop service" dates that might precede notified "end of service delivery dates" of outphased buildings.

- For services with ADSL and ADSL2+ access, like Bitstream ADSL & ADSL2+, Carrier ADSL & ADSL2+, and Explore ADSL & ADSL2+ a new technical solution is available (see above section 3.5 "ROP-based ADSL(2+)") but it is recommended to migrate to VDSL2 where possible and mandatory to migrate to VDSL2 for homogenizable ROPs.

- The technological migration of current ISDN-BA services to ISDN via IAD services will change the configuration of an OLO Broadband[6] with ISDN-BA voice service to OLO Broadband without voice.

In order to avoid newly installed services to be migrated shortly later, Proximus sends yearly to each Wholesale customer a notice of "**Stop sell**" pursuant to the information delays contractually specified. Similarly, for each outphased building, Proximus will send to each Wholesale customer present in the concerned local net a **notice of service suspension** ("Stop Service") pursuant to the information delays contractually specified for each impacted service, as well as a list of circuits impacted and of possible service alternatives.

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[6] OLO Broadband = Carrier xDSL, BRUO, Bitstream xDSL service.

# 7. Copper outphasing

Proximus' goal is to fully outphase the copper network (feeding and distribution) in the areas (fiberhoods) where FTTH is deployed. **All services provisioned on copper** will have to be migrated to alternative solutions (cfr. table 3) before the end of service delivery date of the fiberhood where they are currently in service.

The table 4 summarizes the current copper outphasing planning until mid 2024 as officially notified to the market. **This planning is only indicative and still subject to changes[7].** Operators that signed a GPON NDA can obtain on request the preliminary copper outphasing planning for all fiberhoods where the fiber roll-out started but for which copper outphasing is not notified yet.

Note that at this stage, no copper outphasing is foreseen in FTTB[8] zones.

Table 3: Services to be migrated to alternative solutions mainly include:

| Product type |
| --- |
| Explore EFM (or E-line EFM or NGLL EFM) |
| BROTSoLL Leased lines on Copper |
| Commercial Leased Lines on Copper |
| BRUO (RC and SP) |
| All commercial xDSL based services |
| All Bitstream xDSL based services |
| PSTN on AGW |
| Legacy ISDN BA ([a]) |
| Legacy ISDN-30 |

([a]) A "Stop Service" by 30/09/2022 is planned for legacy ISDN-2 subscriber lines.

[7] Roadworks in parts of a planned Fiberhood might for example lead to an accelerated copper outphasing in the impacted parts of the concerned Fiberhood.

[8] FTTB = Fiber to the Business: industrial zones and buildings with a high concentration of business customers.

Table 4: Copper outphasing planning

| End of Service Delivery | Fiberhood |
|---|---|
| 31/03/2022 | W00-C-Anspach-FH01 |
| 31/03/2022 | W00-C-Anspach-FH02 |
| 31/03/2022 | W00-C-Anspach-FH03 |
| 30/06/2022 | W01-C-Deurne-FH04 |
| 30/06/2022 | W01-C-Gent-FH03 |
| 30/06/2022 | W01-C-Charleroi-FH01 |
| 31/12/2022 | W01-C-Deurne-FH03 |
| 31/12/2022 | W01-C-Gent-FH04 |
| 31/12/2022 | W01-C-Gent-FH07 |
| 31/12/2022 | W01-C-Charleroi-FH03 |
| 31/12/2022 | W01-C-Namur-FH06 |
| 31/12/2022 | W02-D-Diamant-FH01 |
| 31/12/2022 | W02-D-Liege-FH02 |
| 31/12/2022 | W02-D-Hasselt-FH03 |
| 30/06/2023 | W01-C-Gent-FH06 |
| 30/06/2023 | W01-C-Gent-FH09 |
| 30/06/2023 | W01-C-Gent-FH11 |
| 30/06/2023 | W02-D-Liege-FH01 |
| 31/12/2023 | W01-C-Deurne-FH06 |
| 31/12/2023 | W01-C-Deurne-FH07 |
| 31/12/2023 | W01-C-Deurne-FH08 |
| 31/12/2023 | W01-C-Deurne-FH09 |
| 31/12/2023 | W01-C-Gent-FH08 |
| 31/12/2023 | W01-C-Gent-FH10 |
| 31/12/2023 | W01-C-Gent-FH12 |
| 31/12/2023 | W01-C-Roeselare-FH04 |
| 31/12/2023 | W01-C-Charleroi-FH04 |
| 31/12/2023 | W01-C-Charleroi-FH05 |
| 31/12/2023 | W01-C-Namur-FH07 |
| 31/12/2023 | W02-D-Liege-FH03 |
| 31/12/2023 | W02-D-Hasselt-FH01 |
| 30/06/2024 | W01-C-Deurne-FH10 |
| 30/06/2024 | W01-C-Deurne-FH11 |
| 30/06/2024 | W01-C-Gent-FH14 |
| 30/06/2024 | W01-C-Gent-FH15 |
| 30/06/2024 | W01-C-Roeselare-FH05 |
| 30/06/2024 | W02-D-Evere-FH01 |
| 30/06/2024 | W02-D-Leuven-FH01 |

| | |
|---|---|
| 30/06/2024 | W03-C-Liege-FH04 |
| 30/06/2024 | W03-C-Aalst-FH01 |

As mentioned in different chapters higher in this document and in the footnote of Table 4, certain product types are or will be the subject of a global outphasing with "Stop service" dates that might precede notified "end of service delivery dates" in fiberhoods.

In order to avoid newly installed services to be migrated shortly later, Proximus sends yearly to each Wholesale customer a notice of "**Stop sell**" pursuant to the information delays contractually specified. A change of this "Stop sell" approach is currently under investigation and will be communicated timely when decided. Similarly, for each fiberhood, Proximus will send to each Wholesale customer present in the concerned fiberhood a **notice of service suspension** ("Stop Service") pursuant to the information delays contractually specified for each impacted service, as well as a list of circuits impacted and of possible service alternatives.

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