



Proximus Reference Offer for Bitstream Access

Covering the technologies ADSL, Reach Extended
ADSL2, ADSL2+, SDSL and VDSL2

Main Body

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1 Glossary

- **Bitstream:** Unless specified otherwise, the word “Bitstream” equally refers to the two types of service: with Shared or with Dedicated VLANs.
- **Certified Technician:** Any technician employed either by a Beneficiary or by one of Beneficiary’s subcontractors, trained and certified by Proximus in order to perform, in place of a Proximus Technician, the installation of Bitstream without voice lines.
- **CPE:** Customer Premises Equipment.
- **Customer Equipment:** Any equipment that belongs to the Beneficiary.
- **CWS:** Carrier and Wholesale Solutions.
- **DSLAM (ATM-DSLAM):** Digital Subscriber Line Access Multiplexer. ATM-DSLAMs are located in Proximus Local Exchanges, Local Distribution Centers or other relevant points where Proximus has installed such equipment and they are owned and managed by Proximus.
- **GE_NT aggregator:** a GE_NT aggregator is an ATM VC cross-connect, equipped with ATM LTs at the access side and a Gigabit Ethernet NT card and more ATM LTs at the network side.
- **IP-DSLAM:** Digital Subscriber Line Access Multiplexer. IP-DSLAMs are located in Proximus Local Exchanges or Proximus Local Distribution Centers and they are owned and managed by Proximus. Remote IP-DSLAM modules are installed in ROPs.
- **ISDN:** Integrated Service Digital Network.
- **KVD:** street cabinet (in Dutch = Kabel VerDeler).
- **LDC:** Local Distribution Center of Proximus.
- **LEX:** Local Exchange of Proximus.
- **MSO:** Multi Service Ordering.
- **Network Termination Point (NTP):** The termination point of a loop at the End-User premises. The Network Termination Point is part of the Proximus network.
- **NNI:** Network Node Interface.
- **OAL:** OLO (Ethernet) Access Line. An OLO Access Line is an interface between the Customer Equipment and a Proximus Service Router located in one of the two Service PoPs of the Service Area.
- **OLO:** Other Licensed Operator.
- **P-bit:** priority bit.
- **POTS:** Plain Old Telephone Service.
- **PSTN:** Public Switched Telephone Network.
- **ROP:** Remote Optical Platform.
- **Service PoP:** a Service PoP provides access to the Proximus Ethernet network through an NNI connection with a Proximus Service Router. The Service PoPs support the different Bitstream services (ADSL, Reach Extended ADSL2, ADSL2+, SDSL and VDSL2).
- **Service Router:** Proximus Service Routers are installed in each Service PoP and in the LEXs. A Service Router installed in a LEX provides Ethernet transport to a Service PoP.
- **SNA:** Small Network Adaptations.
- **UNI:** User to Network Interface.
- **VDSL2:** Very High Speed Digital Subscriber Line 2.
- **VLAN:** Virtual Local Area Network. Unless specified otherwise, the word “VLAN” equally refers to a Shared VLAN or to a Dedicated VLAN.
- **xDSL:** Abbreviation that covers all DSL technologies: ADSL, Reach Extended ADSL2, ADSL2+, gShDSL, VDSL2. In this document the acronym SDSL will be used instead of the acronym gShDSL.

2 Scope

1. This document provides a description of the Bitstream xDSL services that Proximus offers to a Telecommunications Operator¹, hereafter called “Beneficiary”.
2. This document entails the conditions related to the provision by Proximus to the Beneficiary of the Bitstream ADSL, Reach Extended ADSL2, ADSL2+, SDSL or VDSL2 services, which will enable the Beneficiary to define its own ADSL, Reach Extended ADSL2, ADSL2+, SDSL or VDSL2 products and to market, distribute and sell under its name and on its behalf its own ADSL, Reach Extended ADSL2, ADSL2+, SDSL or VDSL2 products towards End-Users, using Proximus installed and existing Network infrastructure, pursuant to the technical limitation of this existing infrastructure for offering the service.
3. The attention is drawn to the fact that taking into account that the present offer by definition implies the use of the Proximus ATM-DSLAMs and the Proximus IP-DSLAMs, this offer is related to the provision of ADSL, Reach Extended ADSL2, ADSL2+, SDSL and VDSL2 services only.
4. This offer and its tariffs are applicable for cases where ATM-DSLAMs and/or IP-DSLAMs are located in the Proximus premises (LEX or LDC) or remote IP-DSLAMs in the Proximus KVD/ROP and are used by Proximus in the framework of its own retail or wholesale offer.
5. In particular, for VDSL2, this offer will only be applicable for connecting End-User premises either connected to an IP-DSLAM located in the Proximus premises (LEX or LDC) or connected to a Proximus ROP equipped with remote IP-DSLAM modules. The IP-DSLAMs are gradually upgraded with “multi service” line cards to also support ADSL, Reach Extended ADSL2 and ADSL2+ services from the ROP² and from the LEX/LDC.
6. Since 21/10/2013, the scope of this offer and its tariffs has been enlarged for cases where Bitstream ADSL(2+) are delivered from the ROP (and no longer from the LEX or LDC). Since 01/07/2017, the scope of this offer and its tariffs has been enlarged for cases where Bitstream ADSL2+ are no longer sold for Living Units located in copper distribution areas of which all Living Units are in reach of VDSL2 from the ROP. Since 01/02/2018, the scope of this offer and its tariffs has been enlarged for cases where Bitstream ADSL services are no longer sold for Living Units located in copper distribution areas of which all Living Units are in reach of VDSL2 from the ROP. The list of KVDs from which ADSL and ADSL2+ services are no longer sold is available on the Operator Personal Page of the CWS secured website.
7. Proximus does not accept any new order of Bitstream with voice services over ISDN, including:
 - New orders of Bitstream with voice services over ISDN,
 - Conversion from Bitstream with voice services over PSTN to Bitstream with voice services over ISDN,
 - Conversion from Bitstream without voice services to Bitstream with voice services over ISDN,
 - Move of Bitstream with voice services over ISDN.
8. A global stop-service of the installed park of Bitstream ADSL(2+) with voice services over ISDN is not yet planned. Currently the stop-service of installed lines of Bitstream ADSL(2+) with voice

¹ “Telecommunications Operator” under the present reference offer is to be understood as entitled to provide telecommunications services under national legislation, and which is eligible for Bitstream xDSL access. Reference is made to the Annex “General Terms and Conditions” for further details on the eligibility.

² Planned launch date of Re-ADSL2 from the ROP: 22 October 2018.

services over ISDN is factually notified in the framework of the Building Outphasing program and in the framework of ADSL (2+) from ROP and ADSL (2+) from LEX on IP-DSLAM migrations.

9. This document describes in broad terms the technical, operational and financial conditions of the Bitstream xDSL services offered by Proximus.
10. The provision of the hereunder-described services supposes the following list of prerequisites that will need to be met at all times and in all circumstances:
 - Connection between the network of the Beneficiary and the Proximus network (hereafter the "Network") is established pursuant to the principles set out in this document;
 - A copper line from the End-User premises to the LEX, LDC, ROP or other relevant points where Proximus installed ATM-DSLAMs and/or (remote) IP-DSLAMs must be available;
 - If Small Network Adaptations (SNA) works are required to deliver the service and are allowed by the Beneficiary, they will be performed by Proximus.
 - If an impossibility to provision the service cannot be solved by SNA works, the order will be discarded.
11. A Bitstream xDSL service is only offered if technically feasible and in accordance with the deployment in the Proximus network of the different xDSL services. Proximus will confirm the technical feasibility of the End-User line (line condition, distance etc.) after having received the order of the Beneficiary.

3 Practical Information

12. Further requests for information concerning the present reference offer can be made in writing by interested Parties at the following Proximus contact point. In particular, in the event of doubt as to the interpretation of the provisions of this reference offer, Proximus should be contacted. In the event of doubt and as stated by the BIPT, contacting Proximus is without prejudice to any clarification of the reference offer given by the BIPT.
13. In case of disagreement about the interpretation, one of the Parties can request the BIPT for a decision on the specific case. This decision will be taken within a reasonable term and will take into account the legal framework and the valid advice. The possibility for the Parties to present the BIPT a problem in interpretation will not influence the legal means that remain at the Parties' disposal in case of a conflict.

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14. The sharing by Proximus of some types of information (e.g. the addresses of Proximus buildings) is subject to the prior signing of a Non-Disclosure Agreement by the requesting Party. Furthermore, after prior approval by BIPT, a payment may be due for obtaining certain documents.
15. It is also a right for everyone who has signed a Non-Disclosure Agreement to obtain information via the Proximus website through a secured access. Information on how to access the mentioned website can be obtained at the Proximus contact point mentioned above.
16. This offer is made by Proximus PLC under Belgian Public Law, a Belgian autonomous public enterprise organized under the Law of March 21, 1991, with registered office at B-1030 Brussels, 27 Boulevard du Roi Albert II, VAT BE 0202 239 951 Brussels Register of Legal Entities, exercising its activities under the commercial name Proximus, and referred to as "Proximus" in all the documents that are part of this reference offer.

4 Description of the Bitstream ADSL, Reach Extended ADSL2, ADSL2+, SDSL and VDSL2 services in scope of the present offer

4.1 Introduction

17. As most of the European operators, Proximus is in the process of adapting and upgrading its telecommunication infrastructure. In this regard, Beneficiaries shall be able to benefit from any changes in the Proximus broadband network similar to the changes provided by Proximus to its own retail services. In case these network changes have an impact on the Bitstream xDSL services offered, whether a major impact (e.g. introduction of a new technology, a new network element or a new topology) or a minor impact (e.g. a new or adapted configuration, a new or adapted Line Profile or new/adapted product parameters), Proximus will respect the same periods of notice as those defined in the Annex "Planning & Operations" of the present reference offer regarding the IT projects. The BIPT will be informed in any case and can allow exceptions concerning the periods of notice.
18. After having first informed the BIPT, Beneficiaries shall be notified 12 months in advance of any withdrawal of a Bitstream xDSL service in the "existing" infrastructure. If Proximus wants to withdraw a Bitstream xDSL service before the end of these 12 months, an alternative agreement in good faith discussion will be concluded with the concerned Beneficiaries.
19. The present offer is offered with Ethernet transport.
20. The Bitstream ADSL, Reach Extended ADSL2, ADSL2+ and SDSL services will allow the Beneficiary to connect on the Proximus network at Proximus Service PoPs and to receive any Ethernet frames from the End-User using ADSL, Reach Extended ADSL2, ADSL2+ or SDSL technology. The transport between the End-User and the Beneficiary is a combination of ATM on the access and Ethernet in the backbone.
21. The Bitstream VDSL2 service will allow the Beneficiary to connect on the Proximus network at a Proximus Service PoP and to receive any Ethernet frames from the End-User using VDSL2 technology. The transport end-to-end between the End-User and the Beneficiary is Ethernet.
22. The acceptance of the present offer is under the express consent that the Proximus broadband network is susceptible of changing in the future.
23. The offering of Bitstream xDSL services covers:
 - The provision by Proximus of one or several OLO Access Lines between the Customer Equipment and Proximus Service PoPs.
 - The provision and configuration by Proximus of transport bandwidth (VLANs) between the ATM-DSLAMs and the IP-DSLAMs on which the Beneficiary wants to connect End-Users and the OALs on the Proximus Service PoPs to which the Customer Equipment is connected; these VLANs can be either shared between several End-Users of a Beneficiary in a same LEX or dedicated per individual End-User.
 - The provision by Proximus of Bitstream xDSL access lines to the End-User.

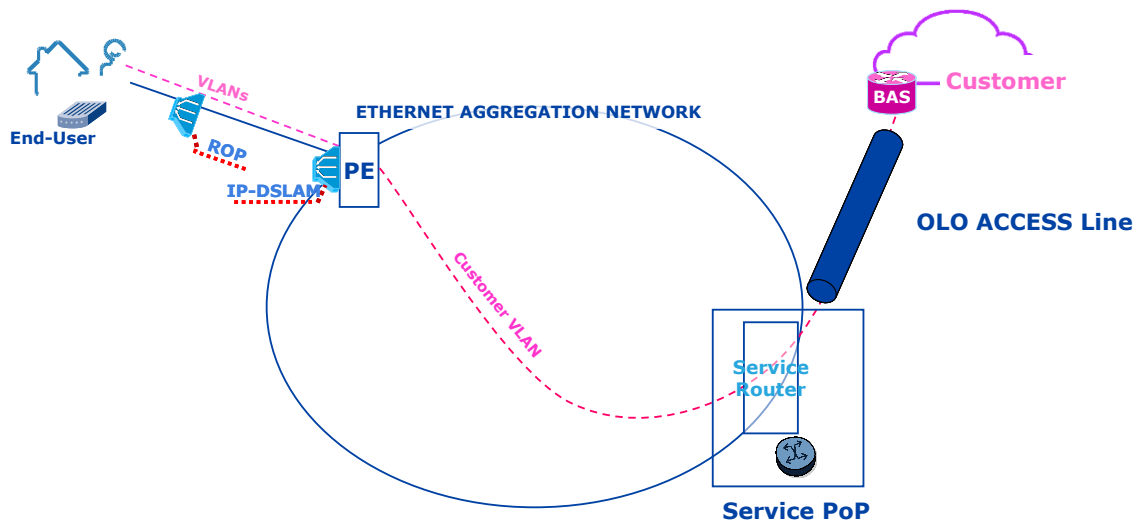


Figure 1: End-to-end overview for services on IP-DSLAMs

24. The Bitstream xDSL service is offered on the basis of the equipment delivered by Proximus' supplier at the moment of the bringing into service of the equipment in a given site.
25. This implies that several versions and platforms can co-exist at the same time, for the use of Proximus as well as for the Beneficiaries of the service.
26. Proximus will ensure the management of the ATM-DSLAMs and the IP-DSLAMs and their proper configuration.
27. If Proximus makes use of a "last buy option" proposed by its supplier at the moment of a version change, Proximus will immediately inform the Beneficiaries and the BIPT.
28. Each new equipment or each new equipment software used by Proximus for its retail or wholesale xDSL services will be made available for the Bitstream xDSL Access Services.
29. In case of software evolutions, Proximus shall ensure that the software will be compatible with the previous one on the same configuration and will inform the Beneficiary about the changes and their consequences. In case of Proximus own pieces of software that would make the solution proprietary to the Proximus environment, Proximus shall ensure the compatibility of subsequent versions with the old ones.
30. If Proximus has to proceed with an upgrade or replacement of equipment or equipment software, this will be done under one or several of the following conditions:
 - The new equipment or equipment software is compatible with the previous one and allows the same configurations;
 - The new equipment or equipment software is compatible with the installed CPEs and modems or a migration path to an updated modem software is made available;
 - The old equipment or equipment software is, for any reason, no longer available from the supplier;
 - The concerned equipment or equipment software is written-off by all Parties;
 - The investments to be realized by all Parties are reasonable and justified.

Proximus can deviate from these conditions if justified to and approved by BIPT.

Proximus will inform the concerned Parties before any upgrade or replacement within the following timeframe: six working days for an upgrade or a maintenance patch, one working day for a correcting maintenance patch.

31. In some local nets where a building (LEX or LDC) is phased out but also on selected ROPs in non Building Outphasing networks, the NDLT-G card (also known as the vectoring or “multi-DSL” card) is also used to provide “ADSL from ROP” connectivity. Due to the incompatibility with the NDLT-G card or the ROP having been activated for VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz or between 552 kHz and 2,2 MHz, some Bitstream services are not supported as from the ROP and are de facto not available on ROPs with ADSL(2+) activated:
- Bitstream ADSL(2+) With Voice + ISDN;
 - Bitstream Re-ADSL2, but will be supported from 22 October 2018 onwards³;
 - Some special VLAN configurations;
 - Bitstream ADSL2+ for ROPs for which VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz is activated;
 - Bitstream ADSL for ROPs for which VDSL2 vectoring in the frequency band between 552 kHz and 2,2 MHz is activated.

The list of ROPs planned to be activated for ADSL(2+) is available on the Operator Personal Page of the CWS secured website.

The list of ROPs planned to be activated with VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz and for VDSL2 vectoring in the frequency band between 552 kHz and 2,2 MHz is also published on the same location.

32. In local nets where a building (LEX or LDC) is phased out, the Bitstream SDSL service will only remain supported until the announced “End-of-Service date” for that local net. The list of the concerned local nets is available on the Operator Personal Page of the CWS secured website. The activation of VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz or between 552 kHz and 2,2 MHz is compatible with the Bitstream SDSL service and the BRUO Raw Copper Type 3 service as long as it remains supported in the local net concerned.
33. In particular, the offering of the ADSL, Reach Extended ADSL2, ADSL2+ and SDSL Bitstream service on ATM-DSLAMs through GE_NT cards covers:
- The provision and the configuration by Proximus of ATM Transport (use of CBR, VBR or UBR+ service as defined further in this offer) between the ATM-DSLAMs and the GE_NT aggregators.
 - The provision by Proximus of Reach Extended ADSL2 or SDSL lines to the End-Users.
 - The provision by Proximus of ADSL2+ lines until 30/06/2017 to the End-Users. Since 01/07/2017 the provisioning by Proximus of ADSL2+ lines is no longer possible to Living Units connectable to ROPs on which all Living Units can be connected in VDSL2. The provisioning of ADSL2+ lines remains possible for Living Units connectable to ROPs on which not all Living Units can be connected in VDSL2, for Living Units connected to KVDs not served by a ROP and for Living Units directly connected to a LEX/LDC.
 - The provision by Proximus of ADSL lines until 31/01/2018 to the End-Users. Since 01/02/2018 the provisioning by Proximus of ADSL lines is no longer possible to Living Units connectable to ROPs on which all Living Units can be connected in VDSL2. The provisioning of ADSL lines remains possible for Living Units connectable to ROPs on which not all Living Units

³ This planning might be adapted to ensure the quality of the deliverable.

can be connected in VDSL2, for Living Units connected to KVDs not served by a ROP and for Living Units directly connected to a LEX/LDC.

34. In particular, the offering of the ADSL, Reach Extended ADSL2⁴ and ADSL2+ Bitstream service through IP-DSLAMs installed in the LEX/LDC or through remote IP-DSLAM modules installed in the ROP equipped with “multi-DSL” cards covers:

- The provision by Proximus of ADSL2+ lines until 30/06/2017 to the End-Users. Since 01/07/2017 the provisioning by Proximus of ADSL2+ lines is no longer possible to Living Units connectable to ROPs from which all Living Units can be connected in VDSL2. The provisioning of ADSL2+ lines remains possible for Living Units connectable to ROPs on which not all Living Units can be connected in VDSL2.
- The provision by Proximus of ADSL lines until 31/01/2018 to the End-Users. Since 01/02/2018 the provisioning by Proximus of ADSL lines is no longer possible to Living Units connectable to ROPs on which all Living Units can be connected in VDSL2. The provisioning of ADSL, ADSL2+ and Re-ADSL2 lines remains possible for Living Units connectable to ROPs from which not all Living Units can be connected in VDSL2.

From 22 October 2018 onwards⁵ : the provisioning of Re-ADSL2 lines for Living Units connectable to ROPs on which ADSL(2+) or VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz or between 552 kHz and 2,2 MHz has been activated.

⁴ Planned launch date of Re-ADSL2 from the ROP: 22 October 2018.

⁵ Proximus might postpone this date to guarantee the quality of the deliverable.

4.2 Transport over the Ethernet backbone

4.2.1 OLO Access Line between a Proximus Service PoP and the Customer Equipment

35. The connection between the network of the Beneficiary and the Proximus network is realized through OLO Access Lines (OAL) between the Customer Equipment and the Proximus Service Routers, sited in the Proximus Service PoPs.
36. In order to use Bitstream services to connect End-Users in a Service Area, the Beneficiary must interconnect with Proximus in at least one of the two Service PoPs of this Area. If the Beneficiary wants to be active everywhere in Belgium, he needs at least one OLO Access Line in each Service Area.
- There are 5 Service Areas for the whole of Belgium, each of them covering its geographical area. Per Service Area there are 2 Service PoPs, located in 2 different buildings. The list of the Proximus Service Areas, their definition and the address of the related Service PoPs is available in Appendix B of this document.
37. The description of the OLO Access Lines and, in particular, the exhaustive list of combinations of bandwidth, protection mode and type (Proximus-sited, Customer-sited or Backhaul) offered by Proximus in the scope of this agreement is described in Appendix A of this document.
38. The Beneficiary is responsible for
- the choice of the Service PoPs on which to terminate its OALs,
 - their dimensioning,
 - the choice of their protection modes,
 - and the choice of their types.
39. The Beneficiary shall pay to Proximus the installation and rental fees of its Access Lines, as set forth in the Annex "Pricing, Compensations and Billing".
40. For information on the Technical Specifications of the OLO Access Lines, reference is made to Annex 2, section "OLO Access Line" of the present reference offer.
41. The connection between the Proximus Service Router and the Customer Equipment is subject to a successful testing procedure, as set forth in Annex 2C, section "Testing the OAL" of the present reference offer.

4.2.2 Ethernet Transport between the GE_NT aggregators and the Customer Equipment

42. The Bitstream ADSL, Reach Extended ADSL2, ADSL2+ and SDSL services terminated on ATM-DSLAMs in the LEX/LDC offer an Ethernet connectivity between the OLO Access Lines and the GE_NT aggregators:

43. Four service qualities are offered for these Bitstream services, differentiated by the Ethernet p-bit (P):

P=0: best effort.

P=1: low priority.

P=3: medium priority.

P=5: highest priority and better performance for jitter and delay sensitive traffic.

Each OLO may configure up to 2 Shared VLANs per service quality per LEX and 1 Dedicated VLAN per ATM VC per End-User.

44. Shared and Dedicated VLANs

- o Shared VLANs: the VCs of the Bitstream ADSL, Reach Extended ADSL2, ADSL2+ and SDSL services are transported over Ethernet; the ATM traffic of the Beneficiary's End-Users is aggregated and transported in 1 VLAN per service quality and per LEX to a Service PoP in the same Service Area where an OLO Access Line of the Beneficiary is connected. In each LEX Proximus will create, for the Beneficiary, maximum 8 VLANs - each dedicated to a specific service quality with a maximum of 2 VLANs per service quality - to which the Beneficiary's End-Users are connected in order to transport its Bitstream traffic from the GE_NT aggregators to the Customer Equipment and reversely.
The same Shared VLANs will be used by the Beneficiary for all Bitstream services described hereafter.
- o Dedicated VLANs: per Beneficiary's End-User, one or more VCs are mapped in one or more Dedicated VLANs to a Service PoP in the same area where an OLO Access Line of the Beneficiary is connected.

45. VLANs will be configured by Proximus, on behalf of the Beneficiary, to transport the Bitstream traffic of the Beneficiary's End-Users from the GE_NT aggregators on which Beneficiary's End-Users are connected up to the Customer Equipment and reversely.

4.2.3 Ethernet Transport between the IP-DSLAM and the Customer Equipment

46. The Bitstream ADSL, Reach Extended ADSL2⁶, ADSL2+ and VDSL2 services terminated on IP-DSLAMs equipped with "multi-DSL" cards in the LEX/LDC or in the ROP and the Bitstream VDSL2 services terminated on IP-DSLAMs equipped with "VDSL2-only" cards offer an Ethernet connectivity between the OLO Access Lines and the IP-DSLAMs.

47. Four service qualities are offered for these Bitstream services, differentiated by the Ethernet p-bit (P):

⁶ Planned launch date of Re-ADSL2 from the ROP: 22 October 2018.

- P=0: best effort.
- P=1: low priority.
- P=3: medium priority.
- P=5: highest priority and better performance for jitter and delay sensitive traffic.

48. Shared and Dedicated VLANs

- Shared VLANs:
 - for the VCs of the ADSL(2+) lines, the ATM traffic of the Beneficiary's End-Users is aggregated and transported in 1 VLAN per service quality and per LEX to a Service PoP in the same Service Area where an OLO Access Line of the Beneficiary is connected.
 - for the Virtual LANs (VLANs) of the VDSL2 lines, the Ethernet traffic of a Beneficiary's End-User is aggregated and transported in 1 VLAN per service quality and per LEX to a Service PoP in the same Service Area where an OLO Access Line of the Beneficiary is connected.

In each LEX where Proximus installed IP-DSLAMS, Proximus will create for the Beneficiary maximum 8 Shared VLANs if these VLANs were not yet created for the ATM-DSLAMS - each dedicated to a different service quality, with a maximum of 2 VLANs per service quality – to which the Beneficiary's End-Users are connected in order to transport their Bitstream traffic from the IP-DSLAMS (and ATM-DSLAMS) to the Customer Equipment and reversely. The same Shared VLANs are used by the Beneficiary for the Bitstream ADSL, Reach Extended ADSL2, ADSL2+ and SDSL services on ATM-DSLAMS described herebefore, for Ethernet connectivity between the OLO Access Lines and the LEX.

- Dedicated VLANs:
 - for ADSL(2+) lines, per Beneficiary's End-User, VCs are mapped in one or more Dedicated VLANs to a Service PoP where an OLO Access Line of the Beneficiary is connected. This Service PoP has to be located in the same Service Area as the LEX of the Beneficiary's End-User.
 - For VDSL2 lines, per Beneficiary's End-User, all Virtual LANs (VLANs) are transported transparently in 1 Dedicated VLAN to a Service PoP in the same Service Area where an OLO Access Line of the Beneficiary is connected.

49. VLANs will be configured by Proximus, on behalf of the Beneficiary, to transport the Bitstream traffic of the Beneficiary's End-Users from the IP-DSLAMS on which Beneficiary's End-Users are connected up to the Customer Equipment and reversely.

4.2.4 **Bandwidth between the Local Exchanges and the Proximus Service PoP to which the Customer Equipment is connected**

4.2.4.1 **For Shared VLANs**

50. The Beneficiary will order bandwidth and more precisely Shared VLANs between each LEX in which the Beneficiary wants to connect End-Users and where Proximus installed GE_NT aggregators in the ATM-DSLAMS and/or IP-DSLAMS and the Proximus Service PoP(s) to which the Beneficiary is connected. Each OLO may order up to 2 VLANs per service quality per LEX.

51. The bandwidths that can be ordered by the Beneficiary between a LEX and a Proximus Service PoP are summarized in the following table, in function of the service quality chosen by the Beneficiary for the related VLAN.

Offered VLAN Bandwidth (Mbps)	P=0	P=1	P=3	P=5
2	Y	Y	Y	Y
4	Y	Y	Y	Y
6	Y	Y	Y	Y
8	Y	Y	Y	Y
10	Y	Y	Y	Y
12	Y	Y	Y	Y
14	Y	Y	Y	Y
16	Y	Y	Y	Y
18	Y	Y	Y	Y
20	Y	Y	Y	Y
30	Y	Y	Y	Y
40	Y	Y	Y	Y
50	Y	Y	Y	Y
60	Y	Y	Y	Y
70	Y	Y	Y	Y
80	Y	Y	Y	Y
90	Y	Y	Y	Y
100	Y	Y	Y	Y
120	Y	Y	Y	N
140	Y	Y	Y	N
160	Y	Y	Y	N
180	Y	Y	Y	N
200	Y	Y	Y	N
220	Y	Y	Y	N
240	Y	Y	Y	N
260	Y	Y	Y	N
280	Y	Y	Y	N
300	Y	Y	Y	N
320	Y	Y	N	N
340	Y	Y	N	N
360	Y	Y	N	N
380	Y	Y	N	N
400	Y	Y	N	N
420	Y	Y	N	N

440	Y	Y	N	N
460	Y	Y	N	N
480	Y	Y	N	N
500	Y	Y	N	N
600	Y	N	N	N
700	Y	N	N	N
800	Y	N	N	N
900	Y	N	N	N
1gig	Y	N	N	N

52. Higher bandwidths could be possible in the future, if reasonable and sufficient justification can be submitted by the Beneficiary to Proximus.

4.2.4.2 For Dedicated VLANs

53. There is no pre-provisioning of the Dedicated VLANs. Each Dedicated VLAN is configured by Proximus at the moment of the implementation of the End-User line.
54. The configuration of Dedicated VLANs for ADSL, Reach Extended ADSL2, ADSL2+ and SDSL lines connected on ATM-DSLAMs is described in Annex 2A.
55. The configuration of Dedicated VLANs for ADSL, Reach Extended ADSL2⁷ and ADSL2+ lines connected on IP-DSLAMs installed in the LEX/LDC or connected on remote IP-DSLAMs in the ROP is described in Annex 2B.
56. The configuration of Dedicated VLANs for VDSL2 lines is described in Annex 2C.

4.2.5 Interconnection at LEX level

57. In addition to the connection of the Beneficiary on Service PoP level described in the above sections of this chapter, which allows the Beneficiary to use Bitstream services to connect End-Users of the whole Service Area, the Beneficiary may also interconnect with Proximus at LEX level.
58. The interconnection at LEX level is defined in Annex 2C – Technical Specifications.

⁷ Planned launch date of Re-ADSL2 from the ROP: 22 October 2018.

4.3 Activation of ADSL, Reach Extended ADSL2, ADSL2+ or SDSL on a specific End-User line

4.3.1 General

59. Subject to the condition that the Beneficiary has ordered the necessary infrastructure (OLO Access Line and Shared VLANs for Shared Bitstream services), the Beneficiary will be able to offer to End-Users services based on ADSL, Reach Extended ADSL2, ADSL2+ or SDSL technology, using Proximus' installed and existing Network infrastructure, pursuant to the technical limitation of this existing infrastructure for offering ADSL, Reach Extended ADSL2, ADSL2+ or SDSL technology.
60. Proximus will deliver the Bitstream ADSL, Reach Extended ADSL2, ADSL2+ or SDSL service to specific End-Users according to the Beneficiary's orders submitted to Proximus. Proximus is able to configure the individual lines of End-Users at the DSLAM level on the basis of the following characteristics:
 - Maximum 4 VC per ADSL, Reach Extended ADSL2, ADSL2+ or SDSL connection.
61. The VCs of each Bitstream ADSL, Reach Extended ADSL2, ADSL2+ or SDSL line will be configured by Proximus, on behalf of the Beneficiary, with Ethernet transport.
62. As long as the total number of Line Profiles in the system is below 128, the Beneficiary can obtain 8 own ADSL or Reach Extended ADSL2 or ADSL2+ Line Profiles and 8 own ATM Profiles. Additionally, the Beneficiary can use the profiles defined in a common pool of 20 ADSL, 2 Reach Extended ADSL2 and 2 ADSL2+ Line Profiles and 100 ATM Profiles. To provision a Bitstream line under a specific technology (i.e.: ADSL, Reach Extended ADSL2 or ADSL2+), the Beneficiary may only use its own profiles or the common profiles, defined for this technology.
 - The ADSL or ADSL2+ profiles in the common pool will be added after agreement of all concerned Beneficiaries and Proximus.
 - The Reach Extended ADSL2 profiles in the common pool will be defined for maximum downstream bit rates of 1120 kbps and 512 kbps, other bit rate values being maximum upstream 192 kbps and minimum downstream and upstream 32 kbps.
 - The 2 ADSL2+ profiles in the common pool will be defined for maximum downstream bit rates of respectively 9.024 kbps and 12.000 kbps, other bit rate values being maximum upstream 512 kbps, minimum downstream 288 kbps and minimum upstream 96 kbps.
63. When activating an SDSL line, the Beneficiary can choose one of the SDSL Line Profiles defined in the following table:

Bit rate
192 Kbps
384 Kbps
640 Kbps
832 Kbps
1024 Kbps
1216 Kbps
1472 Kbps
1664 Kbps
2048 Kbps
2304 Kbps

64. The provision of ADSL, Reach Extended ADSL2 or ADSL2+ on an existing End-User line requires the installation of an in-line filter or a full rate splitter both at the End-User designated premises and at the concerned Proximus Local Exchange to split the traffic between data and voice. At the Proximus Local Exchange side, this filter is integrated in the DSLAM.
65. The provision of ADSL, Reach Extended ADSL2, ADSL2+ or SDSL on an existing End-User line also requires the installation of a modem or a modem/router at the End-User side. The access to the Bitstream ADSL, Reach Extended ADSL2, ADSL2+ or SDSL service at the End-User site will be at the Proximus Network Termination Point (NTP).
66. The activation of a Bitstream ADSL or ADSL2+ with voice services over ISDN is no longer possible since 01/02/2017.
67. For the Bitstream ADSL, Reach Extended ADSL2 or ADSL2+ with voice service, an intervention of a Proximus or Partner Technician on the End-User site will be required in the following cases:
- In case of new activation, if the End-User line has an alarm configuration⁸
 - In case of new activation, if the End-User line has a PABX configuration⁹
68. For the Bitstream SDSL, the service is provisioned on a non-active loop or active loop where the telephone service or leased line service or other relevant service(s), if any, has to be released, (which means that, if the service is firstly released, the loop turns back to a non-active loop), using processes similar to those developed for raw copper loops, on top of a Circuit ID.
69. The installation of a Bitstream ADSL, Reach Extended ADSL2 or ADSL2+ line includes the installation of a full rate splitter between the Proximus Network and a new Network Termination Point at the End-User site to which the modem can be connected.
70. The Beneficiary who orders a Bitstream ADSL, Reach Extended ADSL2 or ADSL2+ is responsible to provide Proximus with the correct information regarding the type of equipment present at the End-User premises only in case of PABX and/or alarm configuration (if any).
71. For information, the modem or modem/router used by the End-User must be in conformity with the applicable standardization and its interoperability with the DSLAM must have been demonstrated. Proximus will participate together with the Beneficiary in the solving of interworking issues.
72. The ATU-C handles different standards and supports ADSL, Reach Extended ADSL2 or ADSL2+ modems in conformity with Proximus' UNI.

⁸ A telephone line used for an alarm system is for security reasons directly wired into the wall or the wall socket. As a consequence, the installation using a micro filter is impossible and a full rate splitter must be installed by Proximus.

⁹ Installing micro filters into the wall sockets connected to the PABX would result in these splitters being installed at the wrong place in the configuration. As a consequence, a full rate splitter must be installed by Proximus on the telephone line before it enters the PABX.

The technical specifications of the User to Network Interface (UNI) for ADSL, Reach Extended ADSL2 or ADSL2+ equipment to be connected to the Proximus network can be found on:

<http://www.proximus.com/en/group/governance/regulatory-information>

73. However, attention is drawn to the fact that an ATU-R based on the mentioned standards does not guarantee full interoperability with the ATU-C up to service level since interoperability is still under investigation.
74. Reach Extended ADSL2 is not supported for ISDN lines.
75. The Bitstream ADSL, Reach Extended ADSL2 or ADSL2+ with ISDN voice service is not supported in case of an equivalent ISDN solution configured on a dedicated copper pair.
76. Some Bitstream services are not supported as from the ROP due to the incompatibility with the “multi service” NDLT-G card or the ROP having been activated for VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz or between 552 kHz and 2,2 MHz:
- Bitstream ADSL(2+) With Voice + ISDN
 - Bitstream Re-ADSL2, but will be supported as from 22 October 2018 onwards¹⁰
 - Some special dedicated VLAN configurations
 - Bitstream ADSL2+ on ROPs for which VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz is activated
 - Bitstream ADSL on ROPs for which VDSL2 vectoring in the frequency band between 552 kHz and 2,2 MHz is activated
77. In local nets where a building (LEX) is phased out, the Bitstream SDSL service will only remain supported until the announced “End-of-Service date” for that local net. The list of the concerned local nets is available on the Operator Personal Page of the CWS secured website.
78. Proximus will gradually activate VDSL2 vectoring in the frequency band between 552 kHz and 2,2 MHz for ROPs of which all Living Units of its copper distribution area are in reach of VDSL2 from that ROP. Activation of “VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz” limits the provision of Bitstream services to Bitstream ADSL and Reach Extended ADSL2¹¹ from the ROP and Bitstream SDSL from the LEX/LDC. Activation of “VDSL2 vectoring in the frequency band between 552 kHz and 2,2 MHz” limits the provision of Bitstream services to Bitstream Reach Extended ADSL2 from the ROP and Bitstream SDSL from the LEX/LDC.
- The list of ROPs for which “VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz” or between 552 kHz and 2,2 MHz is activated is available on the Operator Personal Page of the CWS secured website.
- Proximus will notify the Beneficiaries of planned activations of “VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz” or between 552 kHz and 2,2 MHz at least 6 months beforehand. Only ROPs for which ADSL_from_ROP has already been activated will be notified.
- Since 01/07/2017 Proximus can also activate VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz without notification or before the 6 months notification period being expired in the following cases:
- ROPs connected to a street cabinet on which ADSL_from_ROP is already activated but without active ADSL2+ services.

¹⁰ The deliverable might be postponed to guarantee its quality.

¹¹ Planned launch date of Re-ADSL2 from ROP: 22 October 2018.

- ROPs notified for the activation of vectoring in the frequency band between 1,1 MHz and 2,2 MHz for which all ADSL2+ services have been migrated to the alternative solution before the end of the notification period.

Since 01/02/2018 Proximus can also activate VDSL2 vectoring in the frequency band between 552 kHz and 2,2 MHz without notification or before the 6 months notification period being expired in the following cases:

- ROPs connected to a street cabinet on which ADSL_from_ROP is already activated but without active ADSL nor ADSL2+ services.
- ROPs notified for the activation of vectoring in the frequency band between 552 kHz and 2,2 MHz for which all ADSL and ADSL2+ services have been migrated to the alternative solution before the end of the notification period.

Proximus will coordinate with the Beneficiary the migration of the ADSL and ADSL2+ services to an alternative solution, e.g. Bitstream VDSL2 or Bitstream ADSL (not recommended and only possible for ROPs notified for the activation of vectoring in the frequency band from 1,1 MHz to 2,2 MHz).

If Proximus wants to activate "VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz" or between 552 kHz and 2,2 MHz before the end of the notification period, an alternative agreement in good faith discussion will be concluded with the concerned Beneficiaries.

79. For ADSL or ADSL2+, the splitter and modem type are dependent on the type of telephone line (PSTN or ISDN). Consequently, any cease or any conversion on the telephone services may possibly affect the Beneficiary ADSL or ADSL2+ based service and require the installation of new equipment at the End-User premises, at the Beneficiary expense, for the ADSL or ADSL2+ based service in question.
80. Attention of the Beneficiary is drawn to the fact that, for ADSL over ISDN related technology, the ISDN-low-pass filter standardization is not standardized yet (type 3 within ANNEX E from ITU-T 992.1) and mentioned as subject for further study by the standardization commissions. When applying an ADSL over ISDN low-pass filter at the Beneficiary side, it needs to be taken into consideration that in the Proximus network, for ISDN, 4B3T line coding is used.

4.3.2 Network Termination Point for ADSL, Re-ADSL2, ADSL2+ and SDSL

81. The Network Termination Point is the first termination point of a loop at the End-User premises.

82. The access to the high bandwidth at the End-User will be at:

- The Proximus Network Termination Point (NTP) in case of a distributed splitter.
- The splitter egress in case of a full rate splitter (also called conventional splitter).

83. The provision of ADSL, Reach Extended ADSL2, ADSL2+ or SDSL on an existing End-User line requires the installation of a modem or a modem/router at the End-User side:

- For the ADSL-based technologies on a single line PSTN service, the Beneficiary will install a distributed splitter on the Proximus Network Termination Point at End-User site or a full rate splitter between the Proximus Network and the Network Termination Point at End-User site.
- New installations on an ISDN-line are no longer possible since 01/02/2017.
- For the ADSL-based technologies without voice or for SDSL, Proximus (employee or subcontractor) or – if decided by the Beneficiary – a Certified Technician chosen by the Beneficiary will in some cases install a Network Termination Point and/or perform jumpering in the introduction box. This type of intervention is required when Proximus returns through the MSO ordering interface the “With Customer Visit” installation method (also called Telecom installation) as the minimum installation method required and/or when the Beneficiary – after having questioned the End-User – indicates in its order towards Proximus that an NTP (in operable condition) is missing.

84. If during a repair action performed by Proximus on a newly installed without voice End-User line installed without End-User visit by Proximus, it is found that the incident covered by the repair case was due to the absence of a connected NTP, Proximus will be entitled to invoice its repair intervention following the fee defined in the Annex “Pricing, Compensations and Billing” of the present reference offer.

85. If during a repair action performed by Proximus on a newly installed without voice End-User line installed by a Certified Technician, it is found that the incident covered by the repair case was due to the incorrect installation performed by the Certified Technician (whether or not at NTP level), Proximus will be entitled to invoice its repair intervention following the fee defined in the Annex “Pricing, Compensations and Billing” of the present reference offer.

86. In case of Small Network Adaptations, the installation of a Network Termination Point will often be required. For further details on the Small Network Adaptations, reference is made to the Annex “Planning & Operations” of the present reference offer.

87. The NTP can be of the following types:

- PSTN Lines:
 - i. TF95
 - ii. TF2001
 - iii. TF2007
- ISDN Lines (in case of ADSL):
 - iv. TWIN
 - v. NT1
- Lines without voice and SDSL:
 - vi. TF2001
 - vii. TF2007

88. The NTP is part of the Proximus public infrastructure. Proximus is owner of this infrastructure and of this NTP.

4.3.3 Spectrum Management and equipment aspects

89. Reference is made to the BRUO reference offer, especially the Annex C - Technical Specifications, chapter "Pair selection rules".

4.3.4 Deployment rules

4.3.4.1 ADSL

90. ADSL is allowed for loops with attenuation at 800Hz of less than 6,5dB.

91. In order to improve the provisioning and repair processes, ADSL deployment curves have been developed on the basis of statistics of the actual network. Different curves are defined for ADSL over POTS and for ADSL over ISDN as well as for the upstream and the downstream for both ADSL flavours. Those curves are only deployment rules and not a performance guarantee. The curves are subject to evolution and could be reviewed.

ADSL deployment curves

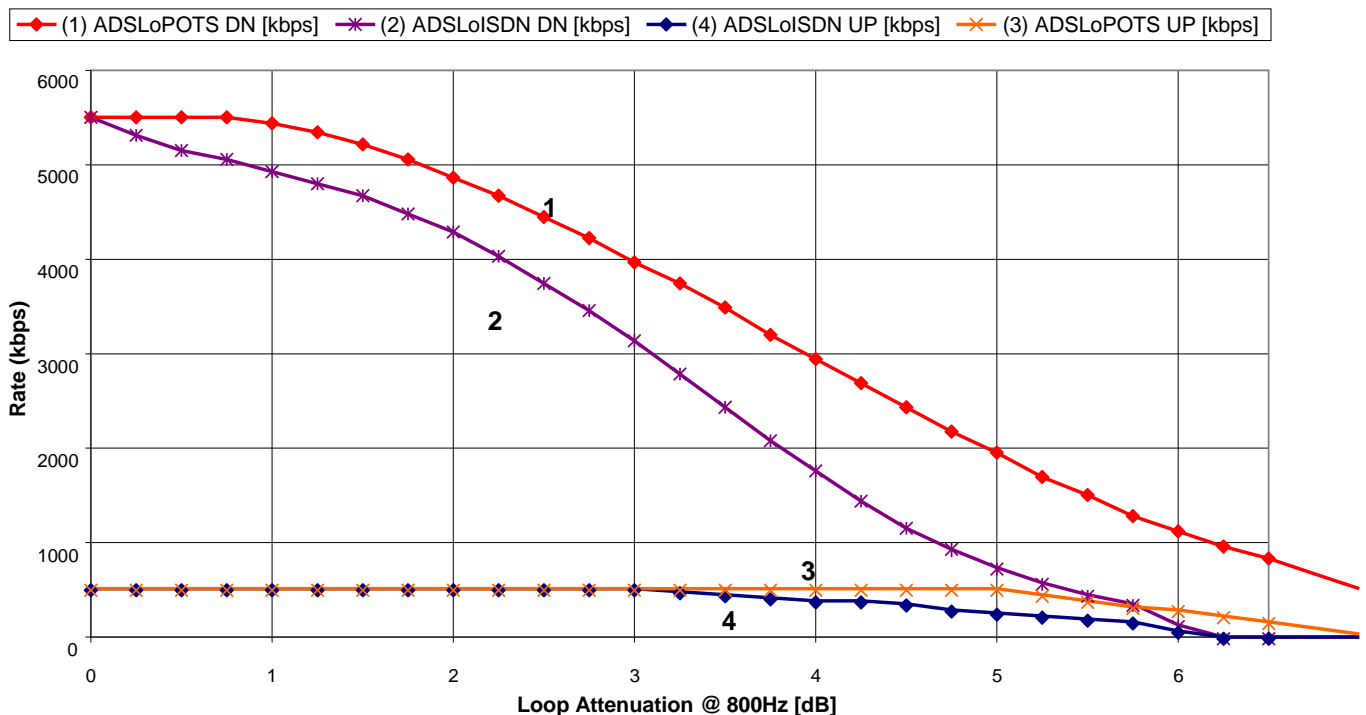


Figure 2

The axes of the above graphic are the loop attenuation at 800Hz, versus the attainable bit rate.

Line 1, the most upper line, represents the ADSL over POTS downstream.

Line 2 represents the ADSL over ISDN downstream.

Line 3 represents the ADSL over POTS upstream.

Line 4 represents the ADSL over ISDN upstream.

92. The discrete values related to the above curve are listed hereunder:

	ADSLoPOTS		ADSLoISDN	
Att @ 800Hz [dB]	(3) ADSLoPOTS UP [kbps]	(1) ADSLoPOTS DN [kbps]	(4) ADSLoISDN UP [kbps]	(2) ADSLoISDN DN [kbps]
0	512	5504	512	5504
0,25	512	5504	512	5312
0,5	512	5504	512	5152
0,75	512	5504	512	5056
1	512	5440	512	4928
1,25	512	5344	512	4800
1,5	512	5216	512	4672
1,75	512	5056	512	4480
2	512	4864	512	4288
2,25	512	4672	512	4032
2,5	512	4448	512	3744
2,75	512	4224	512	3456
3	512	3968	512	3136
3,25	512	3744	480	2784
3,5	512	3488	448	2432
3,75	512	3200	416	2080
4	512	2944	384	1760
4,25	512	2688	384	1440
4,5	512	2432	352	1152
4,75	512	2176	288	928
5	512	1952	256	736
5,25	448	1696	224	576
5,5	384	1504	192	448
5,75	320	1280	160	352
6	288	1120	64	128

6,25	224	960	0	0
6,5	160	832	0	0

Table of ADSL deployment rules

93. The provisioning and repair rules for ADSL are the following:

- Proximus will provision a Bitstream ADSL service on an End-User line only if the loop attenuation at 800Hz is less than 6,5dB and if both upstream and downstream Minimum bit rates of the Line Profile are lower than indicated in the above table for the corresponding ADSL flavour and loop attenuation.
- Proximus will accept repair cases for resynchronisation problems only if both upstream and downstream Maximum bit rates of the Line Profile are lower than indicated in the above table for the corresponding ADSL flavour and loop attenuation.
(The nearest above loop length in the table shall be considered).

4.3.4.2 Reach Extended ADSL2

94. Reach Extended ADSL2 from the LEX/LDC is allowed for loops with attenuation at 800Hz comprised between 6,5 and 8dB.

95. Reach Extended ADSL2 from the ROP is allowed from 22 October 2018¹² onwards from ROPs activated for ADSL_from_ROP or activated for VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz or 552 kHz and 2,2 MHz.

96. Reach Extended ADSL2 is not allowed over ISDN loops.

97. The provisioning and repair rules for Reach Extended ADSL2 from the LEX/LDC are the following:

- Proximus will provision a Bitstream Reach Extended ADSL2 service from the LEX/LDC on an End-User line if the following conditions are respected :
 1. The loop attenuation at 800Hz falls between 6,5 and 8dB.
 2. Upstream Minimum bit rate is not greater than 64kbps.
 3. Downstream Minimum bit rate is not greater than 256kbps.
 4. Free ATM-DSLAM ports are available in the LEX/LDC.
- Proximus will accept repair cases for resynchronisation problems only if :
 1. Upstream Maximum bit rate is not greater than 192kbps.
 2. Downstream Maximum bit rate is not greater than 512kbps.
- Proximus will provision a Bitstream Reach Extended ADSL2 service from the ROP on an End-User line if the following conditions are respected :
 1. The loop attenuation at 800Hz falls below 6,5dB.
 2. ADSL_from_ROP is activated or the ROP is activated for VDSL2 vectoring in the frequency band between 1,1 MHz and 2,2 MHz or 552 kHz and 2,2 MHz.

¹² Proximus might postpone the deliverable to guarantee its quality.

4.3.4.3 ADSL2+

98. If the Beneficiary has chosen one of the 2 common ADSL2+ Line Profiles defined above, Proximus will provision the Bitstream ADSL2+ service on an End-User line in function of the following table:

Att @ 800Hz [dB]	Maximum Upstream [kbps]	Maximum Downstream [kbps]	Minimum Upstream [kbps]	Minimum Downstream [kbps]
<1,5	512	12.000	256	288
<2,5	512	9.024	256	288

These values are applicable for Bitstream ADSL2+ with voice lines on PSTN and for Bitstream ADSL2+ without voice lines.

In case of ADSL2+ with voice lines on ISDN, the following values are applicable:

Att @ 800Hz [dB]	Maximum Upstream [kbps]	Maximum Downstream [kbps]	Minimum Upstream [kbps]	Minimum Downstream [kbps]
<1,25	512	12.000	256	288
<2,25	512	9.024	256	288

Those values are only deployment rules and not a performance guarantee. The values are subject to evolution and could be reviewed.

99. Proximus could add other Line Profiles than the 2 above-defined. This will only be possible after individual validation of the profiles by Proximus, in line with the timing specified hereafter and conditional to the availability of Proximus IT resources to validate and to implement them in the Proximus systems.

- The validation of a Line Profile by Proximus consists in defining for which attenuation range this profile can be configured by Proximus in order to guarantee the stability of the lines dimensioned with this profile as well as of all other xDSL lines installed in the same cable bundle.
- The attenuation range will of course also be used to validate each individual order of a Bitstream ADSL2+ line: every order of a line that falls outside the attenuation range applicable for the profile specified in the order will be discarded (either for a common or for an additional Line Profile).
- For any demand of additional profiles and applicable timing, reference is made to the section "Ordering of Dedicated VLAN profiles" of the Annex "Planning & Operations" of the present reference offer.

100. In order to clarify the rule applicable in case of repair and to help the Beneficiaries define, if necessary, additional Line Profiles for ADSL2+, Proximus delivers hereunder the ADSL2+ deployment table. This table is based on the ADSL percentile 90 and on the estimated gain between ADSL2+ and ADSL:

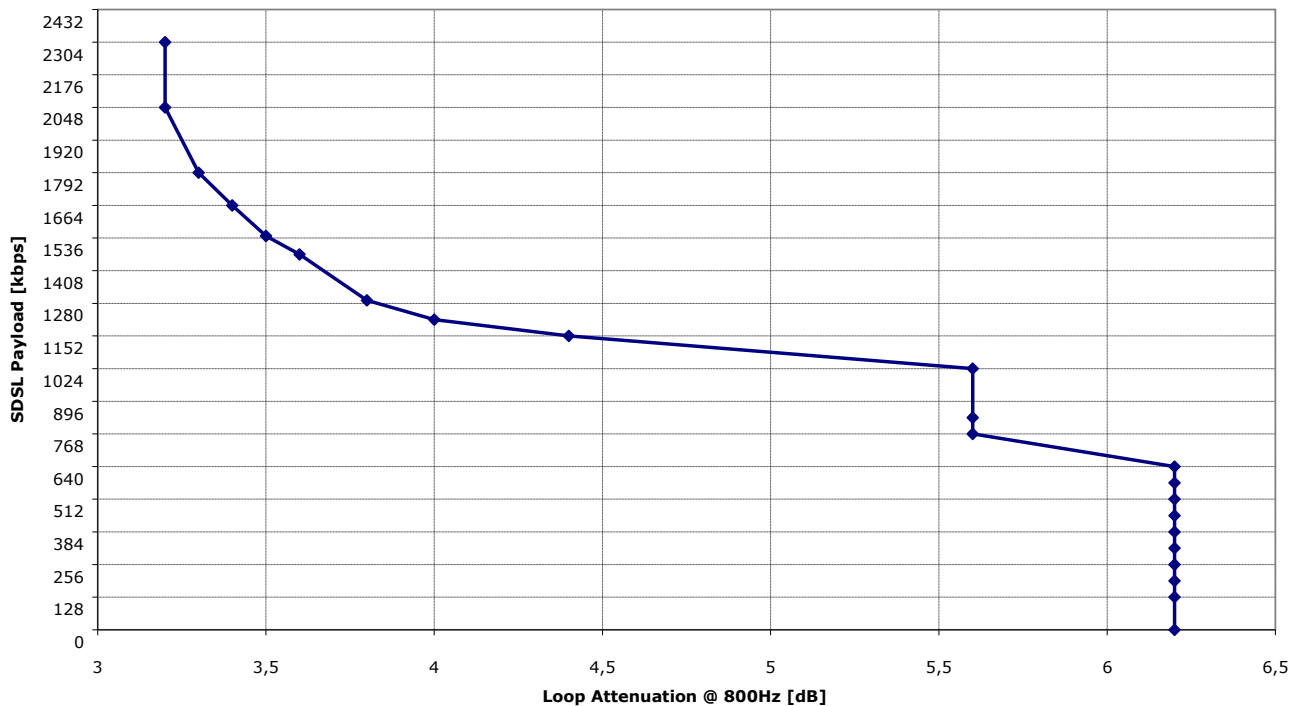
	ADSL2+overPOTS		ADSL2+overISDN	
Att @ 800Hz [dB]	(3) ADSL2+oPOTS UP [kbps]	(1) ADSL2+oPOTS DN [kbps]	(4) ADSL2+oISDN UP [kbps]	(2) ADSL2+oISDN DN [kbps]
0	512	11008	512	11008
0,25	512	10656	512	10464
0,5	512	10336	512	9984
0,75	512	9984	512	9536
1	512	9536	512	9024
1,25	512	9024	512	8480
1,5	512	8480	512	7936
1,75	512	7904	512	7328
2	512	7296	512	6720
2,25	512	6720	512	6080
2,5	512	6112	512	5408

- By similarity to ADSL, Proximus will accept repair cases for resynchronization problems on a Bitstream ADSL2+ line only if both upstream and downstream Maximum bit rates of the Line Profile are lower than indicated in the above table for the corresponding ADSL2+ flavour and loop attenuation.
- With respect to lines dimensioned with a Line Profile above the curve, Proximus will not do physical repair for instabilities or transmission quality issues for ADSL2+ lines provisioned at 9 or 12Mbps. The same principle as for ADSL shall be applied and a decrease speed to a target bit rate below the estimated ADSL2+ percentile 90 curve shall be requested before sending a technician.

4.3.4.4 SDSL

101. The present graph doesn't show the bit rates Beneficiaries can order. These bit rates are defined in the table with the SDSL Line Profiles in the section "General".
102. However, this graph shows the limitations bit rates versus loop attenuation at 800Hz as proposed by Proximus. This means that if a Beneficiary's order exceeds these rules, his order will be discarded.
103. The limitations were calculated by taking into account the presence of potential signal perturbations (ADSL, SDSL) in the same quad and adjacent ones.
104. Tests were performed on feeding and distribution cables on the test environment of Proximus.
105. Equipment: Chipset: Globespan, version 1.5
106. The maximum deployment of SDSL systems can limit the deployment of ADSL to some extent because of the risk of interference between SDSL and ADSL, which may be found in the same quad according to the pair selection rules. Therefore, the following attenuation at 800Hz restrictions have to be respected for the SDSL systems:

SDSL Bitstream Curve



107. The following table gives the x-y data of this graph; linear interpolation is to be used for points that are not listed in the table:

Att @ 800Hz	SDSL Line Rate (kbps)	SDSL Payload [kbps]
3,2	2312	2304
3,2	2056	2048
3,3	1800	1792
3,4	1672	1664
3,5	1552	1544
3,6	1480	1472
3,8	1300	1292
4	1224	1216
4,4	1160	1152
5,6	1032	1024
5,6	840	832
5,6	776	768
6,2	656	640
6,2	592	576
6,2	528	512
6,2	464	448
6,2	400	384
6,2	336	320
6,2	272	256
6,2	200	192
6,2	136	128
6,2	0	0

Note: this curve is subject to evolution.

4.4 Activation of Bitstream VDSL2 on a specific End-User line

4.4.1 General

108. Subject to the condition that the Beneficiary has ordered the necessary infrastructure (OLO Access Line and VLAN(s)¹³), the Beneficiary will be able to offer to End-Users services based on VDSL2 technology, using Proximus' installed and existing Network infrastructure, pursuant to the technical limitation of this existing infrastructure for offering VDSL2 technology.
109. Proximus will deliver Bitstream VDSL2 services to specific End-Users according to the Beneficiary's orders submitted to Proximus. Proximus is able to configure the individual lines of End-Users at the IP-DSLAM level on the basis of the following characteristics:
1. With or without voice service
 - "With voice" means: data service offered in combination with a Proximus PSTN/ISDN line¹⁴.
 - "Without voice" means: data service offered without combination with a Proximus PSTN/ISDN line.
 - Bitstream VDSL2 with ISDN voice service is not supported in case of an equivalent ISDN solution configured on a dedicated copper pair.
 2. With Shared or with Dedicated VLANs
 - "With Shared VLANs":
 - Maximum 4 VLANs per End-User line, each dedicated to a different service quality. The 4 service qualities are:
 - P=0: best effort.
 - P=1: low priority.
 - P=3: medium priority.
 - P=5: highest priority.
 - The VLANs of different Beneficiary's End-User lines are aggregated per service quality and per LEX and transported in 1 Shared VLAN to a Service PoP where an Access Line of the Beneficiary is connected.
 - "With Dedicated VLANs":
 - Maximum 4 Ethernet service qualities per VDSL2 connection, each service quality being differentiated by the Ethernet p-bit (P). The 4 service qualities are:
 - P=0: best effort.
 - P=1: low priority.
 - P=3: medium priority.
 - P=5: highest priority.
 - All VLANs of an individual Beneficiary's End-User line are transported transparently in 1 Dedicated VLAN to a Service PoP where an Access Line of the Beneficiary is connected.

¹³ Only for Bitstream VDSL2 lines on Shared VLANs. The Shared VLANs are also used for ADSL, Reach Extended ADSL2, ADSL2+ and SDSL services.

¹⁴ New Bitstream xDSL services can't be ordered in combination with an ISDN service.

3. Configuration by Proximus of the VDSL2 Line Profile according to the rules set forth in the sections “VDSL2 Deployment Rules” and “Dynamic Line Management (DLM)”. For the complete list of available Line Profiles, reference is made to the Annex “Technical Specifications”, section “DSL profiles at UNI (Layer 1)” of the present reference offer.
110. For VDSL2, the splitter is dependent on the type of telephone line (PSTN or ISDN). Consequently, any cease or any conversion on the telephone services may possibly affect the Beneficiary VDSL2 based service and require the installation of new equipment at the End-User premises. Such installation will be at the Beneficiary’s expenses.

4.4.2 Use of the distribution pairs for VDSL2

111. The Bitstream VDSL2 service will only be delivered by Proximus on the direct pairs of the distribution cables, as defined in the Annex C “Technical Specifications” of BRUO, in the section “Common technical specifications for the equipment to be connected to the loop”, sub-section “VDSL2”.
112. The Beneficiary can check the availability of direct pairs for a certain End-User through the use of the MSO Pre-Checks functionalities.

4.4.3 Internal cabling for VDSL2

113. To order a Bitstream VDSL2 service for a specific End-User, the Beneficiary must respect, at the premises of this End-User, the technical specifications regarding internal cabling defined in the Annex C “Technical Specifications” of BRUO, in the section “Common technical specifications for the equipment to be connected to the loop”, sub-section “VDSL2”.
114. If the specifications mentioned in the above paragraph are not fulfilled, one Bitstream VDSL2 line could disturb the other VDSL2 lines in the same cable bundle.
115. Therefore, the non-respect of the specifications mentioned in the present section ‘Internal cabling for VDSL2’ will trigger at Proximus the downgrade of the line towards a repair profile.

4.4.4 Network Termination Point for VDSL2

116. The Network Termination Point is the first termination point of a loop at the End-User premises. The Network Termination Point is part of the Proximus network.
117. The NTP required for Bitstream VDSL2 is the model TF2007, equipped with its specific centralized splitter. This splitter protects the transmission of the VDSL2 signal towards the VDSL2 modem.
118. When correctly placed as first introduction point, the TF2007 and its specific full rate splitter are specially designed to respect the internal cabling rules mentioned in the section “Internal cabling for VDSL2” of the present document.
119. This full rate splitter presents transmission characteristics specific to VDSL2 but is also suitable for ADSL-based technologies.

120. Beneficiary or Beneficiary's End-User is responsible for the delivery and installation of the full rate splitter on the NTP.
121. The access to the high bandwidth at the End-User will be at the splitter egress of the centralized splitter.
122. In multi-users buildings where a complete RJ45 structured cabling is available from a building distribution frame, the direct use of the RJ45 pluggable filter (VDSL2 compatible) is an alternative for the TF2007.
123. During the provisioning of a Bitstream VDSL2 without voice line, Proximus (employee or subcontractor) or – if decided by the Beneficiary – a Certified Technician chosen by the Beneficiary will in some cases install a Network Termination Point and/or perform jumpering in the introduction box. This type of intervention is required when Proximus returns through the MSO ordering interface the 'With Customer Visit' installation method (also called Telecom installation) as the minimum installation method required and/or when the Beneficiary – after having questioned the End-User – indicates in its order towards Proximus that an NTP (in operable condition) is missing.
124. If during a repair action performed by Proximus on a newly installed Bitstream VDSL2 without voice line installed without End-User visit by Proximus, it is found that the incident covered by the repair case was due to the absence of a connected NTP, Proximus will be entitled to invoice its repair intervention following the fee defined in the Annex "Pricing, Compensations and Billing" of the present reference offer.
125. If during a repair action performed by Proximus on a newly installed Bitstream VDSL2 without voice line installed by a Certified Technician, it is found that the incident covered by the repair case was due to the incorrect installation performed by the Certified Technician (whether or not at NTP level), Proximus will be entitled to invoice its repair intervention following the fee defined in the Annex "Pricing, Compensations and Billing" of the present reference offer.
126. In case of Small Network Adaptations, the installation of a Network Termination Point will often be required. For further details on the Small Network Adaptations, reference is made to the Annex "Planning & Operations" of the present reference offer.

4.4.5 Bitstream VDSL2 modem

127. The provision of VDSL2 on an existing End-User line also requires the installation of a modem at the End-User side. This modem will be provided and installed by the Beneficiary or the Beneficiary's End-User according to the requirements set forth in the following paragraph.
128. The modem used by the End-User must be in conformity with the applicable standardization and must be interoperable with the Proximus network. The Beneficiary has two options:
 - The Beneficiary can use a standard modem (called Proximus CPE) as defined and described in the Annex 2C, Technical Specifications (section "Modem"). This modem is supported on the Proximus network and may be installed at End-User side.
 - The Beneficiary can use its own modem (called OLO CPE) that will operate in a similar manner as a standard Proximus CPE. In this case, specific Roles and Responsibilities

apply (described in the Annex “Roles & Responsibilities throughout the OLO CPE lifecycle” of the present reference offer).

4.4.5.1 VDSL2 Modem firmware upgrades

129. The use of a Bitstream VDSL2 line requires that the modem at the End-User side is kept up-to-date. Inappropriate firmware versions can lead to perturbations on other VDSL2 lines.
130. Proximus regularly performs remote upgrades on all Proximus CPEs that are upgradable to bring them to the appropriate firmware version. Nevertheless, some of the modems are not upgradable by the Proximus upgrade platform. **The Beneficiary is responsible to upgrade or replace the non-upgradable modems on request of Proximus 4 months after a request (for Shared VLAN and Dedicated VLAN).** Proximus therefore communicates to the Beneficiary a list of non-upgradable modems and the possible solutions to upgrade them.
131. Proximus CPEs can be non-upgradable for the following reasons:
 - The management VLAN is not accessible by Proximus on a Bitstream Dedicated VLAN product,
 - The management VLAN has been de-activated by the OLO,
 - There is a bug in the modem firmware,
 - A wrong firmware has been installed,
 - The OLO has not upgraded the rescue firmware and the operational firmware to the same version,
 - Possible other causes.
132. The timeline used by Proximus to communicate all necessary information is the following:

Timing	Process
4 months before deadline	Proximus provides OLO with: <ul style="list-style-type: none"> - Request to upgrade CPE, - List of the CPEs to be upgraded, - Process on how to upgrade the CPE, - New CPE firmware.
Deadline	As from this deadline, Proximus can assign a fall-back Line Profile on End-User lines with a non-compliant CPE that could impact other End-User lines.

4.4.5.2 Non-compliant VDSL2 CPEs

133. Non-compliant CPEs can impact other End-Users of Bitstream VDSL2 services. Therefore, after the upgrade deadline, Proximus reserves the right to **change the service delivered to a fall-back profile** for all the End-Users with a non-compliant VDSL2 CPE.
134. A non-compliant CPE is
 - Proximus CPE: a CPE with an outdated firmware,
 - OLO CPE: a CPE with a firmware that does not comply with the obligations described in the Annex “Roles & Responsibilities throughout the OLO CPE lifecycle” of the present reference offer,

- Other cases: all CPEs that are not described in the present reference offer.

4.4.5.3 Connection of a VDSL2 CPE to the network

135. When a **new VDSL2 CPE** is connected to the network, it should be in the **latest version of the appropriate firmware**. The Beneficiary therefore has to upgrade the Proximus CPE to the latest firmware version provided by Proximus if needed. OLO CPEs must be upgraded to the appropriate certified firmware as described in the Annex "Roles & Responsibilities throughout the OLO CPE lifecycle". The Beneficiary has to make sure that the upgrade occurred correctly before the connection.

4.4.6 Bitstream VDSL2 End-User line installation

136. Notwithstanding the deployment rules set forth in this offer, an End-User visit for the installation of a Bitstream VDSL2 End-User line can be avoided if:
 - The End-User is connected to direct pairs as described in the section "Use of the distribution Pairs for VDSL2" of the present document;
 - The internal cabling requirements defined in the section "Internal Cabling for VDSL2" of the present document are met;
 - The NTP defined in the section "Network Termination Point for VDSL2" of the present document is present and correctly connected to the Proximus network.

In order to introduce an order with complete and correct information, the Beneficiary should make sure these conditions are met by using the MSO Pre-Checks functionalities and by questioning its End-User at the order intake or by performing an on-site survey at End-User premises.

4.4.7 VDSL2 deployment rules

137. The VDSL2 Line Profiles defined in the Annex “Technical Specifications”, section “DSL profiles at UNI (Layer 1)” of the present reference offer, will be provisioned by Proximus on an End-User line according to the following deployment rules:

For VDSL2 End-User lines connected to a LEX or LDC or connected to a non-vectorized ROP:

Att _{Loop} [dB]	Length _{Loop} [m]	Line Profile name
<0,4	<400	LP248
<0,7	<700	LP266
<1	<1.000	LP281
<1,4	<1.400	LP304
<1,6	<1.600	LP323
<0,6	<600	LP275 ¹⁵
<0,6	<600	LP288 ¹⁶
<1	<1.000	LP329

Where:

- Att_{Loop} = the loop attenuation at 800 Hz between the ROP/LEX and the End-User premises,
- Length_{Loop} = the loop length between the ROP/LEX and the End-User premises,
- The conditions on loop attenuation and loop length must be fulfilled simultaneously to assign a specific Line Profile on an End-User line.

¹⁵ The profile LP275 (and the related profiles LP276, LP288, LP300) enable OLOs to offer a Bitstream VDSL2 service with higher upstream speeds. These profiles will only be provisioned if the OLO made a specific request to order the “Bitstream VDSL2 High Upstream” product. The details on ordering are available in the “MSO User Guide” document stored on the OLO personal page.

¹⁶ The profile LP288 (and the related profiles LP300 & LP329) enable OLOs to offer a Bitstream VDSL2 service with symmetric profiles. These profiles will only be provisioned if the OLO made a specific request to order the “Bitstream VDSL2 symmetric” product. The details on ordering are available in the “MSO User Guide” document stored on the OLO personal page.

For VDSL2 End-User lines connected to a vectored ROP with 2,2 MHz Vectoring activated:

Att _{Loop} [dB]	Length _{Loop} [m]	Line Profile name	Indicative distance
<0,4	<900	LP040 ¹⁷	<400 m
<0,7	<1.200	LP085 ¹⁷	<700 m
<1	<1.700	LP135 ¹⁷	<1.000 m
<1,4	<2.300	LP196 ¹⁷	<1.400 m
<1,6	<2.700	LP225 ¹⁷	<1.600 m
<0,6	<600	LP275 ¹⁵	<600 m
<0,6	<600	LP288 ¹⁶	<600 m
<1	<1.000	LP329	<1.000 m

Where:

- o Att_{Loop} = the loop attenuation at 800 Hz between the ROP and the End-User premises,
- o Length_{Loop} = the loop length between the ROP and the End-User premises,
- o The conditions on loop attenuation and loop length must be fulfilled simultaneously to assign a specific Line Profile on an End-User line.
- o Note however that the loop length parameter is set at high values for the vectoring zones 1 to 5 meaning that for most loops loop attenuation will be the sole criterion for the Line Profile selection.

For VDSL2 End-User lines connected to a vectored homogenized ROP with 1,1 MHz Vectoring activated ⁽¹⁸⁾

Att _{Loop} [dB]	Length _{Loop} [m]	Line Profile name	Indicative distance
<0,5	<900	LP040 ¹⁷	<500 m
<0,7	<1.200	LP085 ¹⁷	<700 m
<1,1	<1.800	LP135 ¹⁷	<1.100 m
<1,4	<2.300	LP172 ¹⁷	<1.400 m
<1,6	<2.700	LP197 ¹⁷	<1.600 m
<0,6	<600	LP275 ¹⁵	<600 m

¹⁷ Vectoring provisioning profiles or subsequent repair profiles will be configured on End-User lines equipped with a (whitelisted) vector-compliant CPE. Lines equipped with a vector-friendly CPE will be configured with a legacy provisioning profile or a subsequent repair profile.

¹⁸ These deployment rules are only applicable for new lines provisioned since 01/07/2017 on homogenized ROPs that became activated for 1,1 MHz Vectoring.

<0,6	<600	LP288 ¹⁶	<600 m
<1	<1.000	LP329	<1.000 m

Where:

- Att_{Loop} = the loop attenuation at 800 Hz between the ROP/LEX and the End-User premises,
- Length_{Loop} = the loop length between the ROP/LEX and the End-User premises,
- The conditions on loop attenuation and loop length must be fulfilled simultaneously to assign a specific Line Profile on an End-User line.
- Note however that the loop length parameter is set at high values for the vectoring zones 1 to 5 meaning that for most loops loop attenuation will be the sole criterion for the Line Profile selection.

For VDSL2 End-User lines connected to a vectored homogenized ROP with 552 kHz Vectoring activated (¹⁹)

Att _{Loop} [dB]	Length _{Loop} [m]	Line Profile name	Indicative distance
<0,5	<900	LP040 ¹⁷	<500 m
<0,8	<1.200	LP085 ¹⁷	<800 m
<1,15	<1.900	LP135 ¹⁷	<1.150 m
<1,4	<2.300	LP160 ¹⁷	<1.400 m
<1,6	<2.700	LP185 ¹⁷	<1.600 m
<0,6	<600	LP275 ¹⁵	<600 m
<0,6	<600	LP288 ¹⁶	<600 m
<1	<1.000	LP329	<1.000 m

Where:

- Att_{Loop} = the loop attenuation at 800 Hz between the ROP/LEX and the End-User premises,
- Length_{Loop} = the loop length between the ROP/LEX and the End-User premises,
- The conditions on loop attenuation and loop length must be fulfilled simultaneously to assign a specific Line Profile on an End-User line.
- Note however that the loop length parameter is set at high values for the vectoring zones 1 to 5 meaning that for most loops loop attenuation will be the sole criterion for the Line Profile selection.

¹⁹ These deployment rules are only applicable for new lines provisioned since 20/02/2018 on homogenized ROPs that might already be activated for 1,1 MHz Vectoring.

138. Those conditions are applicable for both “with Voice” and “without Voice” Bitstream VDSL2 lines.
139. Those values are only deployment rules and not a performance guarantee. The values are subject to evolution and can be reviewed in the future.

4.4.8 Dynamic Line Management (DLM)

140. DLM (Dynamic Line Management) is a process allowing part of the VDSL2 lines to benefit from higher bit rates for downstream than expected according to the provisioning rules based on loop length and attenuation, without increasing significantly the risk for transmissions errors or instabilities. When a VDSL2 line degrades, DLM can also activate an appropriate lower speed DLM profile. To implement this technique, Proximus developed tools and processes which carry automatically and periodically several series of measures (e.g. : measure of spectrum of the lines) on installed VDSL2 lines and determine, line per line and based on algorithms, if they can be upgraded towards higher downstream profiles. With this process, certain lines with high possibilities can be boosted to a VDSL2 downstream Line Profile with higher downstream bandwidth (see Annex “Technical Specifications”, section “DSL profiles at UNI (Layer 1)” of the present reference offer). DLM on upstream has been implemented differently: DLM can decrease or increase the upstream speed provisioned (e.g. 6 Mbps in legacy zone 2) if needed towards a lower upstream speed (e.g. 6 Mbps in legacy zone 1) or a higher upstream speed (e.g. 10 Mbps in legacy zone 1).
141. This technique does not modify any of the current VDSL2 provisioning rules, which remain unchanged. It only aims at improving the reachable downstream speeds and decreases/increases the upstream speeds if needed, once the lines are already installed, and if they fulfil specific technical requirements.
142. There is no guarantee that the new improved downstream speed once awarded by the DLM process on a VDSL2 line will always remain: if the line spectrum would change, in case for example of cross talk or interferences impacting neighbouring lines, the DLM process could decide to bring the line back to its initial downstream line speed.
143. The DLM process also acts as a repair tool by authorising the latter without having to launch a TBF:
 - o to perform proactive repair actions by changing the current Line Profile configuration to an appropriate DLM repair Line Profile when the line quality degraded too much,
 - o to change the line configuration from a repair Line Profile back to the provisioning Line Profile, a DLM profile or a better DLM repair Line Profile when the line quality improved again.
144. The “DLM on repair” functionality has the following benefits on End-User lines:
 - a. a line that has a repair Line Profile remains in the DLM process without triggering a new TBF and shall “automatically” therefore benefit from higher bit rates as soon as the line quality, stability and performance have improved again,
 - b. a repair action on a specific circuit can, from time to time, improve the situation for other lines in the same copper bundle that had also been set on a repair Line Profile. Lines whose quality improved, e.g. as a side effect of changes on other VDSL2-lines in the copper bundle, can also get rid of their repair Line Profile automatically.
145. The DLM is not a technology guaranteed in time: the DLM functionality may be de-activated in the future in case it would be impacting the VDSL2 network deployment as planned by Proximus.

4.4.9 Vectoring

146. Vectoring is a technology implemented to guarantee higher speeds on VDSL2 lines. The principle of vectoring is to cancel the cross-talk (FEXT) between different VDSL2 lines present in the same copper bundle by injecting an anti-signal on each crosstalk-impaired VDSL2 line of the bundle. With no interference, each vectored VDSL2 line can then operate at higher-speed, as if it were the only line in the bundle. Where VDSL2 lines must co-exist with ADSL2+ lines, vectoring can only be activated from 2,2 MHz onwards (2,2 MHz Vectoring). Where VDSL2-lines must co-exist with ADSL lines but no ADSL2+ lines are anymore present, vectoring can be activated from 1,1 MHz onwards (1,1 MHz Vectoring).
147. To the opposite of DLM, for which there is no guarantee that the improved speed once awarded by the DLM process on a specific VDSL2 line will always remain, the vectored lines will – once vectored – keep their new higher bit rate, based on a continuous real-time process of measurement, processing and correction.
148. Vectoring Line Profiles will be activated on vectored ROPs for VDSL2 End-User lines equipped with a (whitelisted) vector-compliant CPE and fulfilling the deployment rules as defined in the section “VDSL2 deployment rules” of the present document. The lines equipped with a (whitelisted) vector-friendly CPE will keep their active Line Profile while lines equipped with a CPE which is not at least vector friendly will keep a fall-back profile/mode (see section “Special conditions in connection with Repair” of the Annex “Planning & Operations” of the present reference offer).
149. DLM & Vectoring effects can be combined, meaning that DLM is possible on vectoring eligible lines equipped with a (whitelisted) vector compliant modem and configured with a vectoring Line Profile.
150. With vectoring the behaviour of the line is different than with legacy VDSL2 in the sense that the Net Data Rate (=synchronisation rate) on vectored lines is seamlessly adapted depending on fluctuations in line quality within predefined limits.
Also retransmission of data is used in case of errors resulting in an Actual Error Free Throughput Rate that may sporadically be lower as the Net Data Rate (most of the time the actual Error Free Throughput Rate is very close to the Net Data Rate). The Net Data Rate on each vectored line can fluctuate between the “Maximum Net Data Rate” (e.g. 100 Mbps downstream) and a “Minimum Expected Throughput Rate + configured retransmission overhead” below which the line will no longer synchronize.

For a more detailed explanation, reference is made to Appendix “SRA and RTX Explained” of the present reference offer.

4.5 Migrations

151. For detailed information on the migrations, reference is made to the BRUO reference offer (Annex K).

5 Operational Processes

152. The provisioning and repair processes for the OAL, the VLANs and the End-User lines are detailed in the Annex "Planning & Operations" of the present reference offer.

6 Pricing and Billing

153. Principle: all Standard Fees as described in Annex "Pricing, Compensations and Billing" of the present reference offer will be invoiced to and are to be paid by the Beneficiary whenever relevant.
154. The Beneficiary will receive a monthly invoice containing the fees (recurring and non-recurring) for that period. Invoices related to any relevant fees are to be paid within the foreseen deadlines as set out in the Annex "Pricing, Compensations & Billing" of the present reference offer.

7 Usage of a unique service identifier in the Operational Processes

155. For Provide and Change Operator orders Proximus will return the service identifier (circuit ID) in the Technical Order Confirmation (TOC) and Order Closed (OC) messages. The circuit ID (CID) identifies the broadband service configured on the copper pair.
156. Communicating such unique service identifier on the bills and contracts sent by the Beneficiary to the End-User for the services provided on the basis of the present reference offer will help facilitate the change of operator on the Proximus network. Such communication will allow the End-User to provide the recipient operator with the circuit ID to enable a seamless Change Operator process.
157. To that end, the service identifier is a mandatory input for Change Operator orders. The expected value is the circuit ID. In case the latter is unknown, the expected value is 'UNKNOWN'. Should the circuit ID be unknown, this increases the importance of the validation by the Beneficiary with the End-User of the installation address as determined through the MSO interface during the Pre-Checks phase.
158. For Migrate, Change, Cease and Move orders the service identifier (circuit ID) is a mandatory input in the Provide and Cease parts of the order.
159. As long as the broadband service remains active for the same Beneficiary, the service identifier will remain the same. For further details on the service identifier behaviour, reference is made to the "MSO User Guide" documented on the secured wholesale personal page.
160. The Beneficiary will also provide in each repair case the service identifier that was provided by Proximus in the provisioning process.

8 Termination of the voice subscription of the Bitstream with voice service

161. In case of a Bitstream with voice service where both Proximus and the Beneficiary provide services to an End-User, it can occur that the End-User ceases his voice subscription for that Bitstream with voice service. In that case, independently of the reason for termination of the voice subscription, Proximus will ensure that the service on the high bandwidth remains in service.
162. In case of a Bitstream with ISDN voice service where both Proximus and the Beneficiary provide services to an End-User, Proximus may deactivate the ISDN voice service in order to replace it by an equivalent ISDN solution configured on a separate copper pair. In that case, Proximus will ensure that the service on the high bandwidth remains in service and that the Bitstream configuration in the Proximus network remains unchanged (same copper pair and same line card position). Note however that the Bitstream with ISDN voice service is gradually being phased out as it is incompatible with the IP-DSLAM NDLT-G line cards.
163. Proximus will inform the Beneficiary that the Bitstream with voice service has been changed to a Bitstream without voice service, for which the Beneficiary will be charged the monthly rental fee for Bitstream on a non-active loop instead of Bitstream on an active loop.

Appendix A: Description of the OLO Access Line

164. The OLO Access Line is a point-to-point, high-speed data transfer service, offering a speed of 1Gbps or 10Gbps (depending on the different versions defined further in this document), between the Beneficiary's site and the Proximus Ethernet network.
165. The OLO Access Line is based on Proximus' fibre optic infrastructure. This is a comprehensive service which includes the network infrastructure, the transmission equipment and proactive management by Proximus.
166. The OLO Access Line Service is available throughout Belgium. Nevertheless, for each request, Proximus will carry out a preliminary feasibility study to determine the infrastructure works that are required (works in the public and/or private domain, installation of fibre optic cables, entry points into buildings, etc.).
167. The terms, conditions and requirements set out in this section determine the general framework between Proximus and the Beneficiary on the OLO Access Line Service in the framework of the provision of a connection between a Proximus Service Router, located in a Proximus Service PoP, and the Customer Equipment, in the framework of this service. This Service will be referred to hereafter as "OLO Access Line".
168. For the provision of an OLO Access Line, the Beneficiary will subscribe a one (1) year contract, under which the OLO Access Line is made available to the Beneficiary for a fixed term of one year. At the end of this period, the contract will be tacitly renewed for an indefinite duration and can be terminated at any time with a notice of at least one calendar month. If the Beneficiary wishes to terminate the contract during the initial one-year term, the Beneficiary will pay to Proximus a termination fee equal to the total of the rental fees until the end of such term.
169. The Beneficiary may order **Customer-Sited OLO Access Lines**, in case the line terminates in the Beneficiary premises, outside any Proximus colocation, **Proximus-Sited OLO Access Lines**, in case the line terminates in its colocation in the building as the Service PoP, or **Backhaul OLO Access Lines**, in case the line terminates in its colocation in another building than the Service PoP.
170. OLOs who had active OLO-fiber presence in 03CEN and/or 91GKK before 23/05/2017 can subscribe to the "Distant Intro" offer, due to the move of these service PoPs to respectively 03WOM and 91WON (cf. Appendix B).

1. Customer-Sited OLO Access Line

a. Description

- 171. The Customer-Sited OLO Access Line is a connection system that is provided in its entirety by Proximus between the Beneficiary Connection point at the Beneficiary premises and a Proximus Service Router.
- 172. Proximus will install the necessary transmission equipment at the premises of the Beneficiary.
- 173. The Customer-Sited OLO Access Line Service consists of one (1) or more **1 or 10** Gigabit Ethernet (GbE) systems.
- 174. The 1 and 10 GbE systems provided under this Service Plan can be ordered in a 1+1 configuration or a Multichassis LAG configuration. Both protection mechanisms cannot be combined and both lines of any protection solution must have the same speed. The protection schemes can combine a Customer-Sited line with a Proximus-Sited line.
- 175. The Beneficiary Connection point is located at the Beneficiary's premises.

b. Implementation

- 176. The implementation of the Customer-Sited OLO Access Line Service will be in accordance with the Technical Specifications provided in Annex 2 "Technical Specifications" – section "OLO Access Line".

c. General Conditions

- 177. A Customer-Sited OLO Access Line Service can be ordered by the Beneficiary between a specified Proximus Service PoP (Connection Point) and the specified Beneficiary's premises.
- 178. The Beneficiary shall provide and maintain, at its expense, the cabling from the Point of Connection in the Beneficiary Premises to the Customer Equipment including any cross-connections that are required.
- 179. All Proximus transmission equipment shall comply with the appropriate Proximus Technical Specifications provided in Annex 2 "Technical Specifications" – section "OLO Access Line".

d. Specific Conditions

- 180. Proximus will identify each 1GbE / 10GbE Customer-Sited OLO Access Line provided pursuant to the conditions of this section through attributing them a codification number.

2. Proximus-Sited OLO Access Line

a. Preliminary

- 181. A Proximus-Sited OLO Access Line Service can be brought into service with regard to a specified site and the Beneficiary can be entitled to install the equipment required to this effect in the Proximus building concerned, if and only if the Beneficiary has prior to this time signed an appropriate Colocation Agreement with regard to the site concerned.
- 182. The Proximus-Sited OLO Access Line Service can only be used for all connection purposes with the Proximus Ethernet data network.

b. Description

- 183. A Proximus-Sited OLO Access Line is a connection system that is provided in its entirety by Proximus between a Proximus Service Router and the Beneficiary Connection point sited in its colocation in the same building.
- 184. A Proximus-Sited OLO Access Line Service is a connection service where Proximus offers the possibility to a Beneficiary to provide the entire OLO Access Line including the Beneficiary transmission equipment that is installed in a Proximus technical building. The Beneficiary will install its cable infrastructure at least up to an introduction duct designated by Proximus in the immediate vicinity of the Proximus Service PoP (building) in which any Proximus Service Router is located.
- 185. The Beneficiary Point of Connection for this type of OLO Access Line is located in the Proximus premises on the indoor cable connecting the Beneficiary's transmission equipment to the Proximus DDF, at the place where that cable enters the colocation room.
- 186. In the event that Proximus is caused to replace the colocation room in which the transmission equipment of the Beneficiary is installed, then both Parties will cooperate to find a mutually acceptable solution.
- 187. The Beneficiary shall install equipment in its colocation area and following the rules set out in the Colocation Agreement.

c. General Conditions

- 188. All Beneficiary transmission equipment shall comply with the Technical Specifications provided in Annex 2 "Technical Specifications" – section "OLO Access Line".
- 189. The Beneficiary shall provide to its employees full information regarding the content of the rules to be respected regarding Proximus-Sited OLO Access Lines.

d. Procedures

- 190. The Beneficiary is responsible for determining the number of Proximus-Sited OLO Access Line Services that the Beneficiary requires. In this respect, Proximus does not make any representation that it will at all times be in a position to provide the full capacity ordered by the Beneficiary. In particular, it is not excluded that, taking into account possible evolutions in the future, Proximus may be confronted with a high number of requests for the installation of additional colocation spaces in different buildings that would not allow Proximus to respect all relevant times. In these cases, Proximus will have to inform the market.

3. Backhaul OLO Access Line

a. Preliminary

- 191. A Backhaul OLO Access Line Service can be brought into service with regard to a specified site and the Beneficiary can be entitled to install the equipment required to this effect in the Proximus building concerned, if and only if the Beneficiary has prior to this time signed an appropriate Colocation Agreement with regard to the site concerned.

192. Backhaul OLO Access Line Services can only be used for all connection purposes with the Proximus Ethernet data network.
193. For the sake of clarity, it is noted that OLO Access Lines covered by this document are 1 GbE / 10 GbE OLO Access Lines.
194. 1 GbE / 10 GbE systems provided under this Service Plan do not have Diversity of routing.

b. Description

195. A Backhaul OLO Access Line is a connection system that is provided in its entirety by Proximus between a Proximus Service Router and the Beneficiary Connection point, sited in its colocation in another building than the one hosting the Proximus Service Router.
196. A Backhaul OLO Access Line Service is a connection service where Proximus offers the possibility to a Beneficiary to provide the entire OLO Access Line including the Beneficiary transmission equipment that is installed in a Proximus technical building. The Beneficiary will install its cable infrastructure at least up to an introduction duct designated by Proximus in the immediate vicinity of the LEX (building) in which the Beneficiary colocation is located.
197. The Beneficiary Point of Connection for this type of OLO Access Line is located in the Proximus premises on the indoor cable connecting the Beneficiary's transmission equipment to the Proximus DDF, at the place where that cable enters the colocation room.
198. In the event that Proximus has to replace the colocation room in which the transmission equipment of the Beneficiary is installed, then both Parties will cooperate to find a mutually acceptable solution.
199. The Beneficiary shall install equipment in its colocation area and following the rules set out in the Colocation Agreement.

c. General Conditions

200. All Beneficiary transmission equipment shall comply with the Technical Specifications provided in Annex 2 "Technical Specifications" – section "OLO Access Line".
201. The Beneficiary shall provide to its employees full information regarding the content of the rules to be respected regarding Backhaul OLO Access Lines.

d. Specific Conditions

202. Proximus will identify each 1GbE / 10GbE Backhaul OLO Access Line provided pursuant to the conditions of this section through attributing them a codification number.

e. Procedures

203. The Beneficiary is responsible for determining the number of Backhaul OLO Access Line Services that the Beneficiary requires. In this respect, Proximus does not make any representation that it will at all times be in a position to provide the full capacity ordered by the Beneficiary. In particular, it is not excluded that, taking into account possible evolutions in the future, Proximus may be confronted with a high number of requests for the installation of additional colocation spaces in different buildings that would not allow Proximus to respect all relevant timers. In these cases, Proximus will have to inform the market.

4. Distant Intro

a. Preliminary

- 204. The objective of the “Distant Intro” offer is to reconnect the current Proximus-sited OAL services located in the service PoPs of 03CEN and 91GKK to the respective moved Service PoPs for OLOs who had not yet the possibility to order Proximus-sited connectivity to 03WOM and/or 91WON due to the absence of OLO-fiber there.
- 205. The Distant Intro offer will be withdrawn for OLOs who introduced OLO-fiber capacity in the new Service Node or who use OLO-fiber capacity introduced in the new Service Node by another OLO.
- 206. Only OLOs who had active OLO-fiber presence in 03CEN0 and/or 91GKK0 before 31/05/2017 can subscribe the “Distant Intro” offer.
- 207. Current OAL ports which would have not been ceased or reconnected to their new OLO Service Platform in the new Service Node (03WOM or 91WON) by the notified building closure dates (respectively 30/06/2019 for 03CEN and 30/06/2020 for 91GKK) will be disconnected after these dates.

b. Description

- 208. The “Distant Intro offer” consists in providing a limited number of Proximus fibers (Distant Intros) to the Beneficiary to allow him to reconnect its fibers spliced in different OLO-manholes around the service nodes 03CEN and/or 91GKK via Distant Intros of Proximus towards the OLO colocation rooms in the respective new Service Node buildings 03WOM and/or 91WON.
- 209. These Proximus Distant Intros will provide a connection between OLO manholes around the current Service Nodes 03CEN and 91GKK to the new Service Nodes 03WOM respectively 91WON.
- 210. The total fiber capacity for Distant Intro connectivity is limited so that Proximus will negotiate with each eligible OLO who’s interested in good faith, based on its current number of Proximus OALs rented to 03CEN0 respectively 91GKK0, the number of Distant Intro connections that can be obtained.
- 211. For 91GKK splicing will be done in the fiber manholes as Proximus leaves this building completely.
- 212. For 03CEN the Distant Intros can be patched via the OMDF installed in the technical room 03CEN0250.

c. General Conditions

- 213. All Beneficiary transmission equipment shall comply with the Technical Specifications provided in Annex 2 “Technical Specifications” – section “OLO Access Line”.
- 214. The Beneficiary shall provide to its employees full information regarding the content of the rules to be respected regarding Distant Intros.

5.Product Options

215. The Proximus-sited and Customer-sited implementations generate following “product options” and offer different levels of redundancy.

OAL type	Options	Protection
Standard OAL	1 GE Proximus-sited	-
	10 GE Proximus-sited	-
	1 GE Customer-sited	-
	10 GE Customer-sited	-
	1+1 GE Proximus- and Customer-sited	Port + fibre + card in Proximus Service PoP
	10+10 GE Proximus- and Customer-sited	Port + fibre + card in Proximus Service PoP
	1 GE Backhaul	-
	10 GE Backhaul	
Multichassis OAL	1+1 GE / Proximus-sited	Port + fibre + Service PoP failure
	10+10 GE / Proximus-sited	Port + fibre + Service PoP failure
	1+1 GE / Customer-sited	Port + fibre + Service PoP failure
	10+10 GE / Customer-sited	Port + fibre + Service PoP failure
	1+1 GE / Proximus- and Customer-sited	Port + fibre + Service PoP failure
	10+10 GE / Proximus- and Customer-sited	Port + fibre + Service PoP failure

216. The 1+1 GE and 10+10 GE / Proximus- and Customer-sited protection mechanism of the standard OAL protects against outages of a connection between the Proximus Service PoP and the Customer Equipment and against outages of a Service PoP port. This mechanism does not protect the OLO-traffic against outages of the Service PoP itself which is still a Single Point of Failure (SPOF).
217. To remove this SPOF, the multichassis Customer-sited and/or Proximus-sited OALs offer the possibility to automatically bypass a failing Service PoP by deviating under control of the LACP (Link Aggregation Control Protocol, aka “multichassis LAG”-protocol) all traffic via the second Service PoP which is present in each of the 5 Service Areas.

6. Graphs to illustrate the available solutions

6.1 Standard OAL

a. 1 GE / Proximus-sited

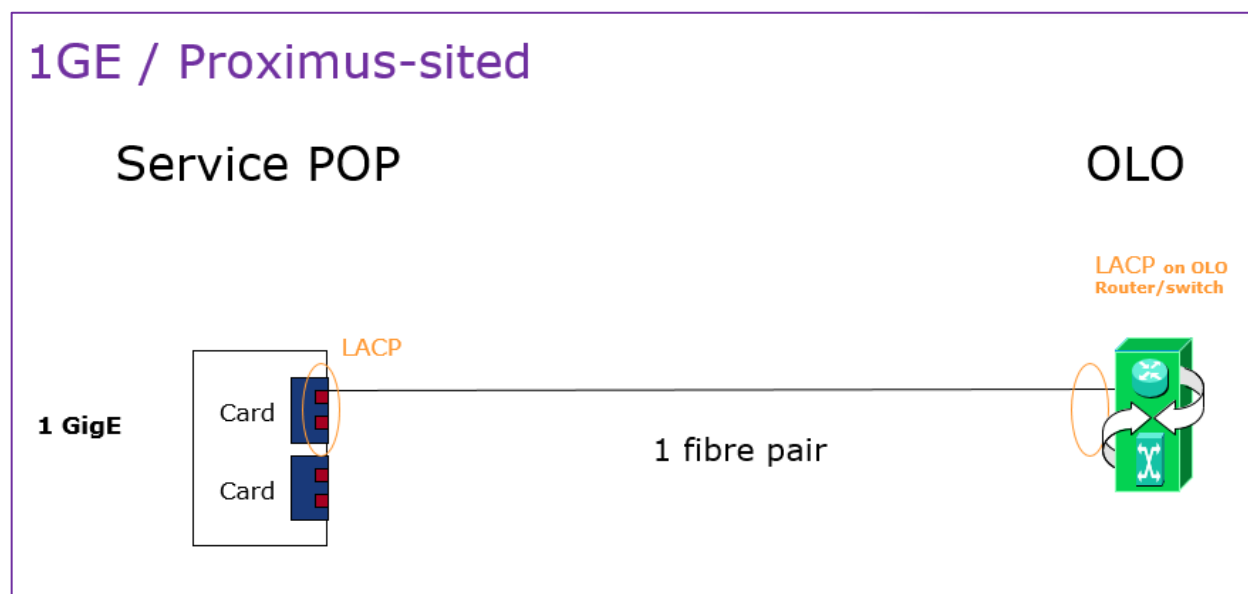


Figure 3: Design of the OLO Access Line 1GE Proximus-sited

b. 10 GE / Proximus-sited

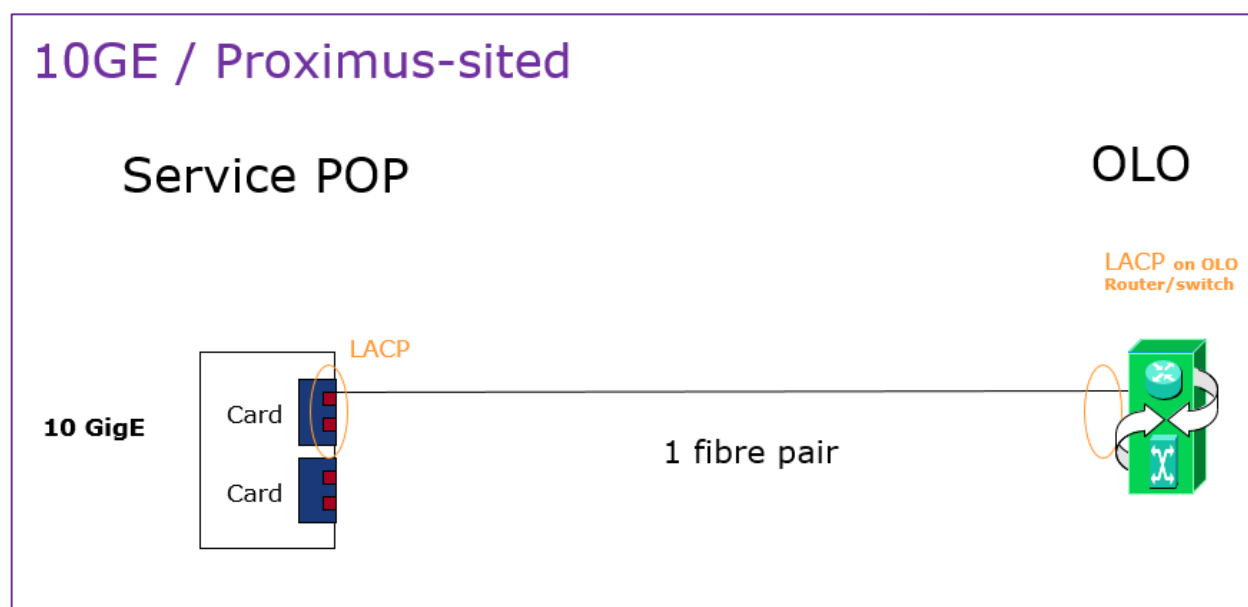


Figure 4: Design of the OLO Access Line 10GE Proximus-sited

c. 1GE / Customer-sited

1GE / Customer-sited

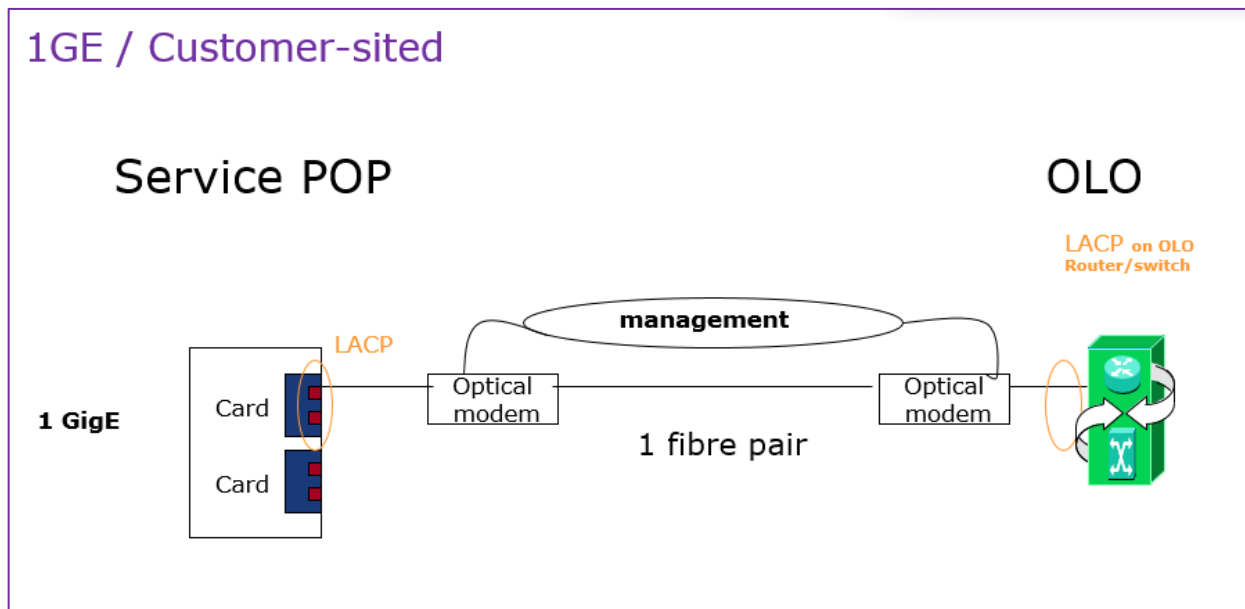


Figure 5: Design of the OLO Access Line 1GE/100Mbps/10Mbps Customer-sited

d. 10 GE / Customer-sited

10GE / Customer-sited

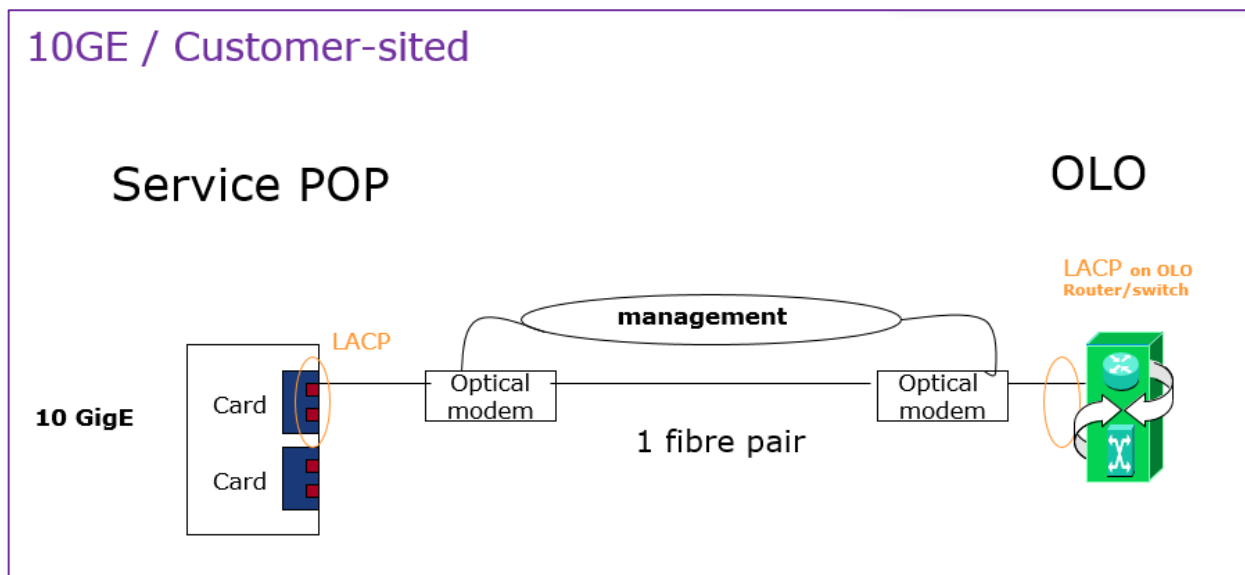


Figure 6: Design of the OLO Access Line 10GE Customer-sited

e. 1+1 GE / Proximus + Customer-sited

The Proximus link is working while the OLO fibre pair is stand-by.

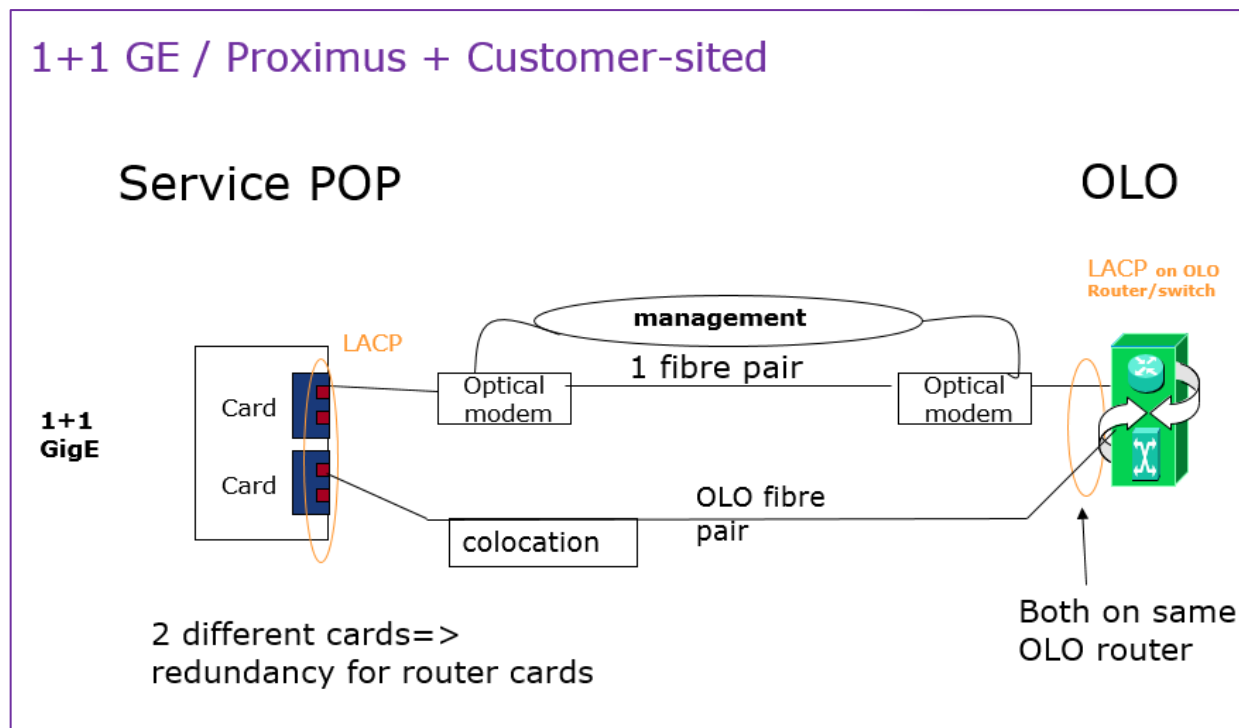


Figure 7: Design of the OLO Access Line 1+1 GE Proximus- & Customer-sited

f. 10+10 GE / Proximus + Customer-sited

The Proximus link is working while the OLO fibre pair is stand-by.

10+10 GE / Proximus+ Customer-sited

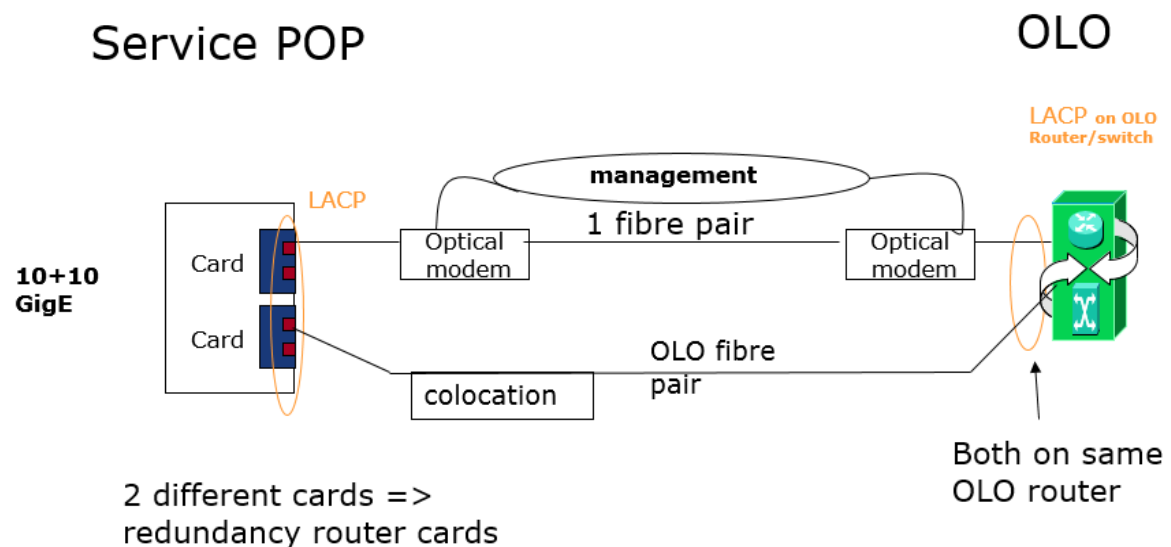


Figure 8: Design of the OLO Access Line 10+10 GE Proximus- & Customer-sited

g. 1 GE Backhaul

1GE Backhaul

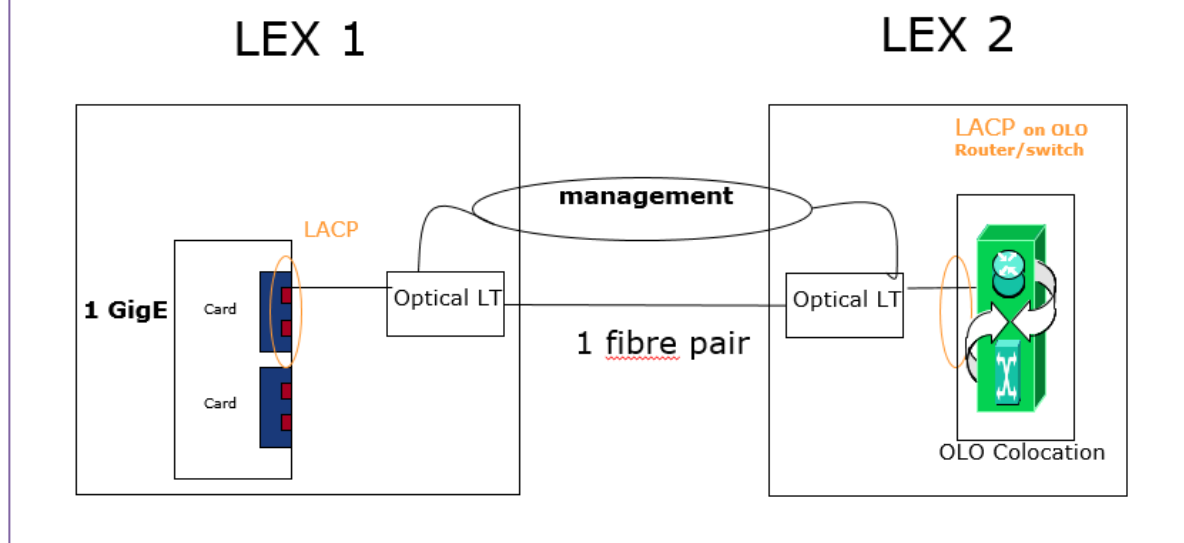


Figure 9: Design of the OLO Access Line 1 GE Backhaul

h. 10 GE Backhaul

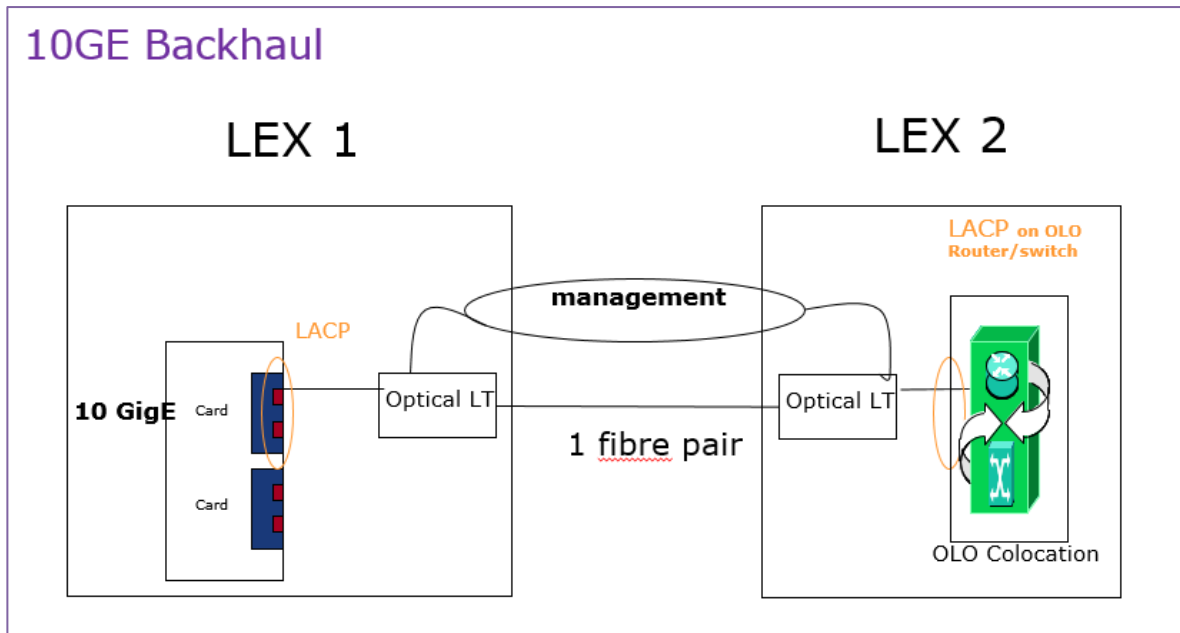


Figure 10: Design of the OLO Access Line 10 GE Backhaul

6.2 Multichassis OAL

a. 1+1 GE / Proximus-sited (Multichassis LAG OAL)

The “Multichassis LAG OLO Access Line” has 2 links, one to each of the two Service PoPs of the Area. One link is working, the other is standby.

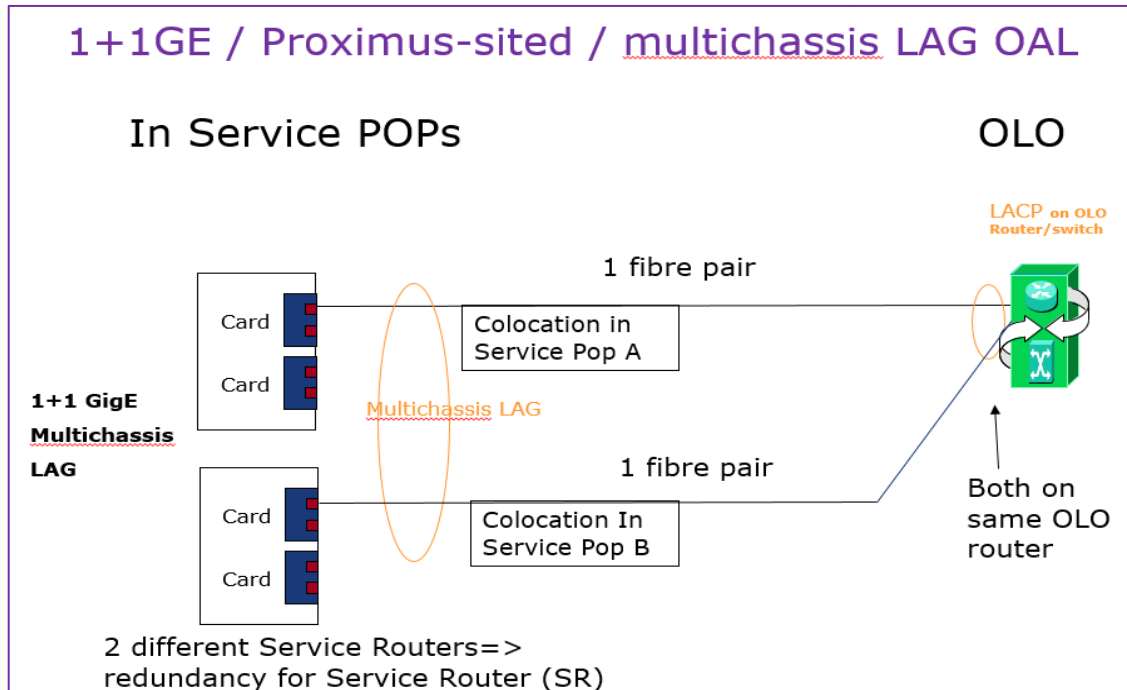


Figure 11: Design of the Multichassis LAG OLO Access Line 1+1 GE Proximus-sited

b. 10+10 GE / Proximus-sited (Multichassis LAG OAL)

The "Multichassis LAG OLO Access Line" has 2 links, one to each of the two Service PoPs of the Area. One link is working, the other is standby.

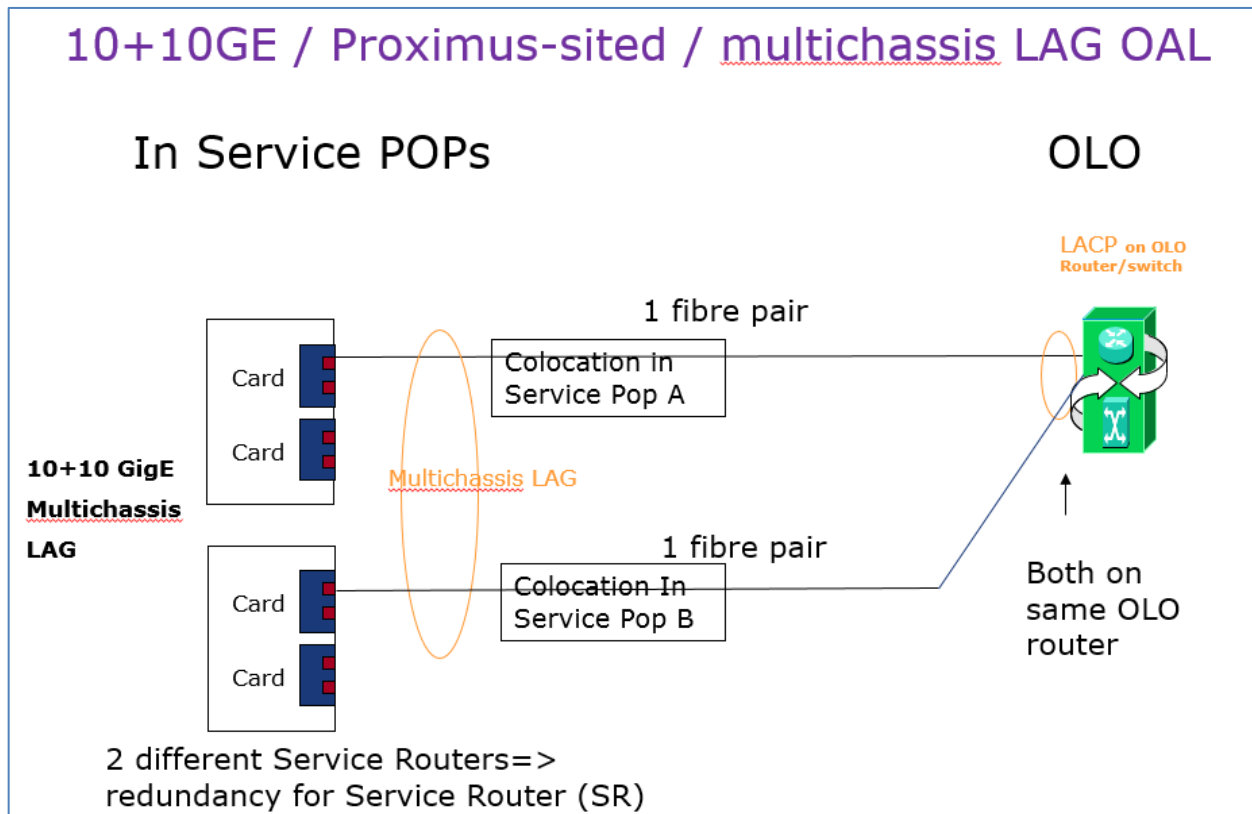


Figure 12: Design of the Multichassis LAG OLO Access Line 10+10 GE Proximus-sited

c. 1+1 GE / Customer-sited (Multichassis LAG OAL)

The “Multichassis LAG OLO Access Line” has 2 links, one to each of the two Service PoPs of the Area. One link is working, the other is standby.

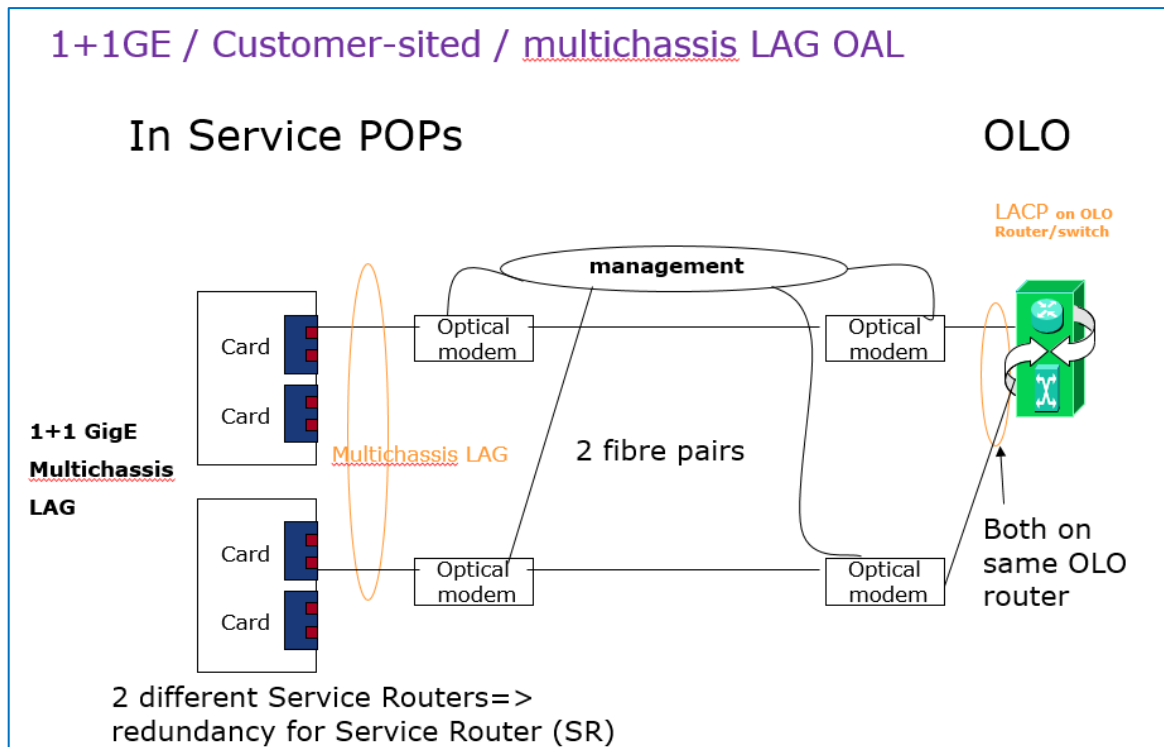


Figure 13: Design of the Multichassis LAG OLO Access Line 1+1 GE Customer-sited

d. 10+10 GE / Customer-sited (Multichassis LAG OAL)

The "Multichassis LAG OLO Access Line" has 2 links, one to each of the two Service PoPs of the Area. One link is working, the other is standby.

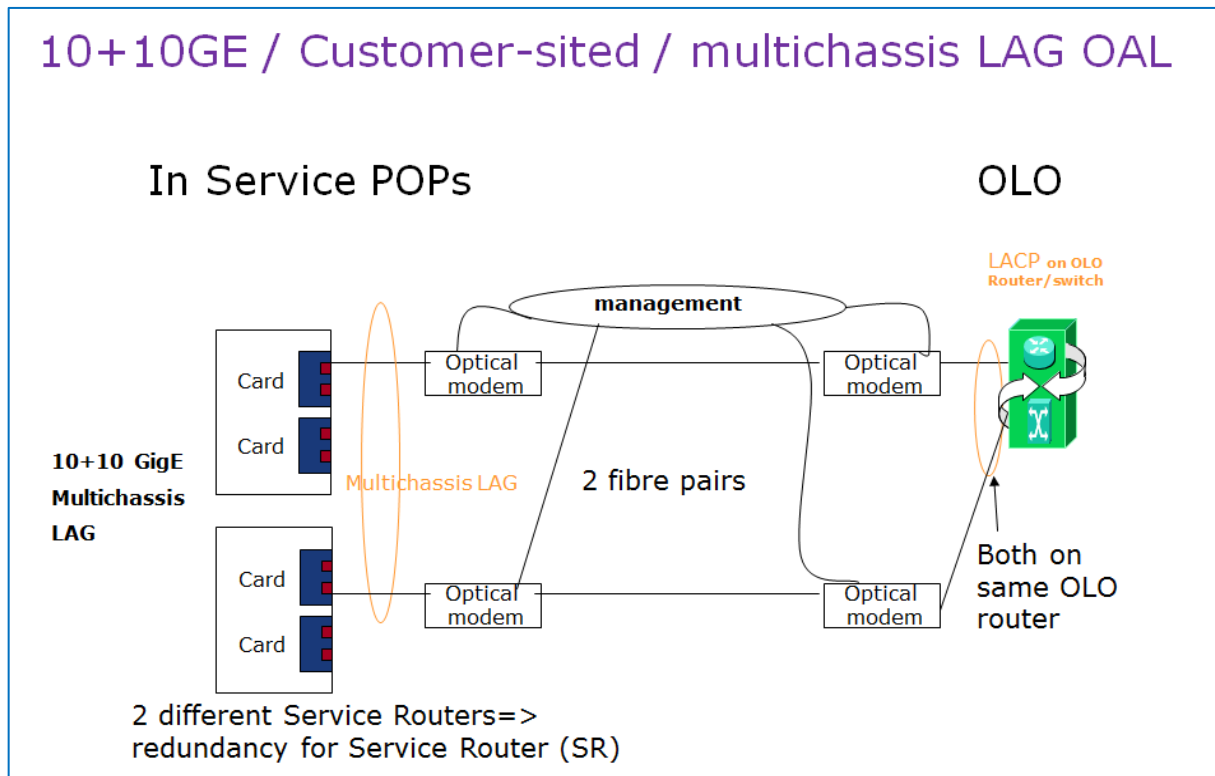


Figure 14: Design of the Multichassis LAG OLO Access Line 10+10 GE Customer-sited

e. 1+1 GE / Proximus + Customer-sited (Multichassis LAG OAL)

The “Multichassis LAG OLO Access Line” has 2 links, one to each of the two Service PoPs of the Area. One link is working, the other is standby.

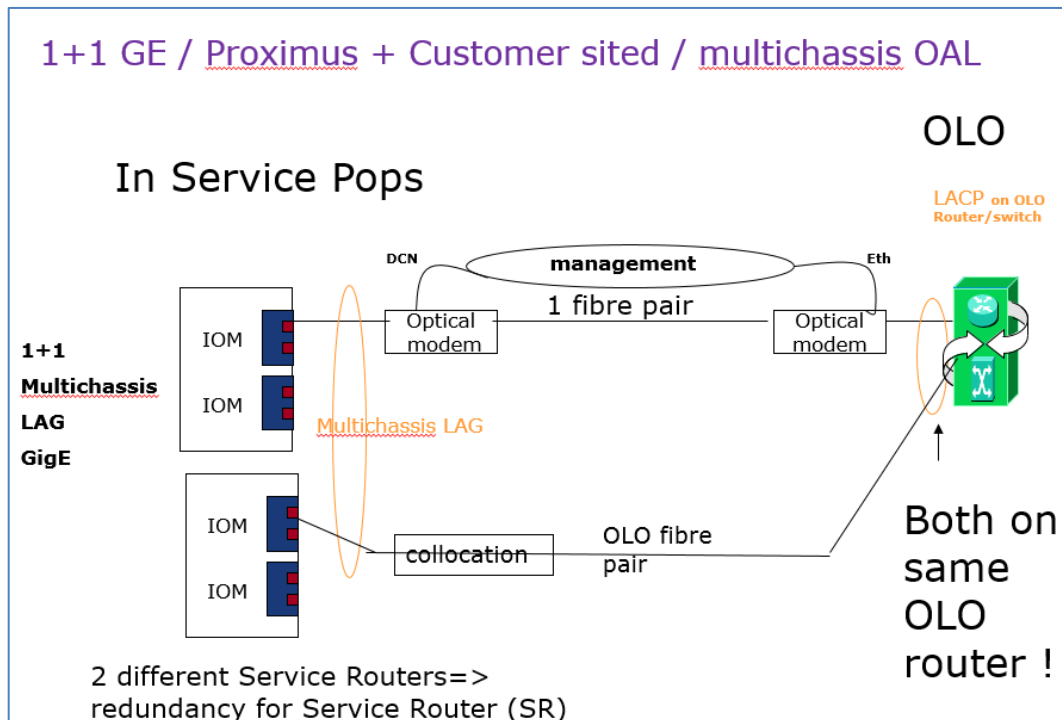


Figure 15: Design of the Multichassis LAG OLO Access Line 1+1 GE Proximus + Customer-sited

f. 10+10 GE / Proximus + Customer-sited (Multichassis LAG OAL)

The “Multichassis LAG OLO Access Line” has 2 links, one to each of the two Service PoPs of the Area. One link is working, the other is standby.

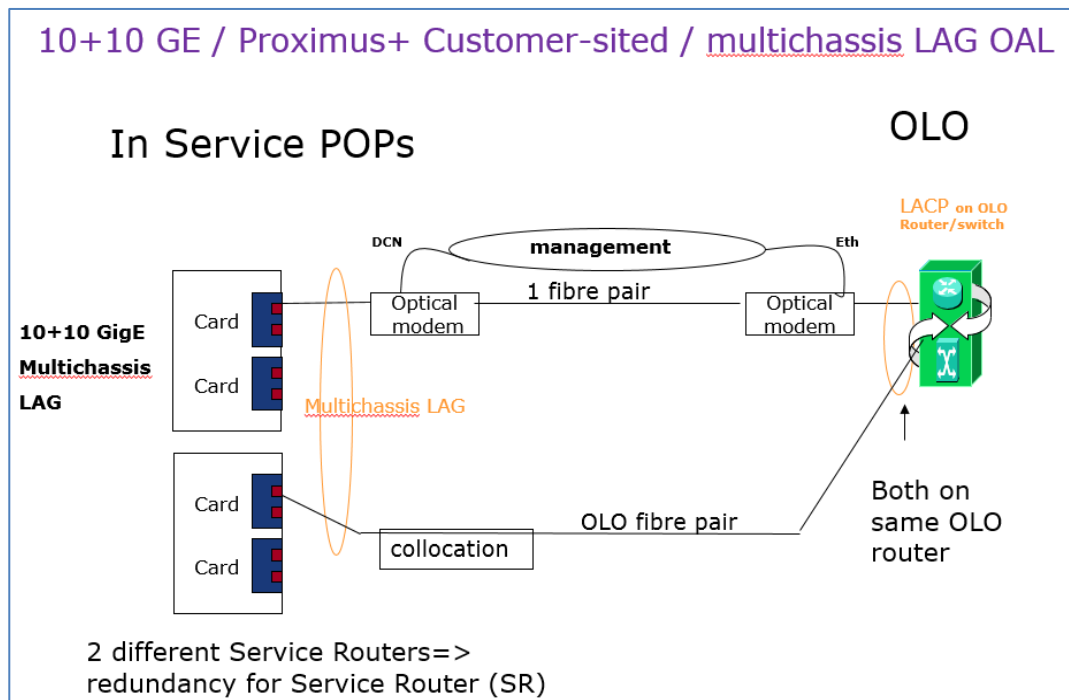


Figure 16: Design of the Multichassis LAG OLO Access Line 10+10 GE Proximus + Customer-sited

6.3. Distant Intro

The figure below visualizes the topology after having activated “Distant Intros”.

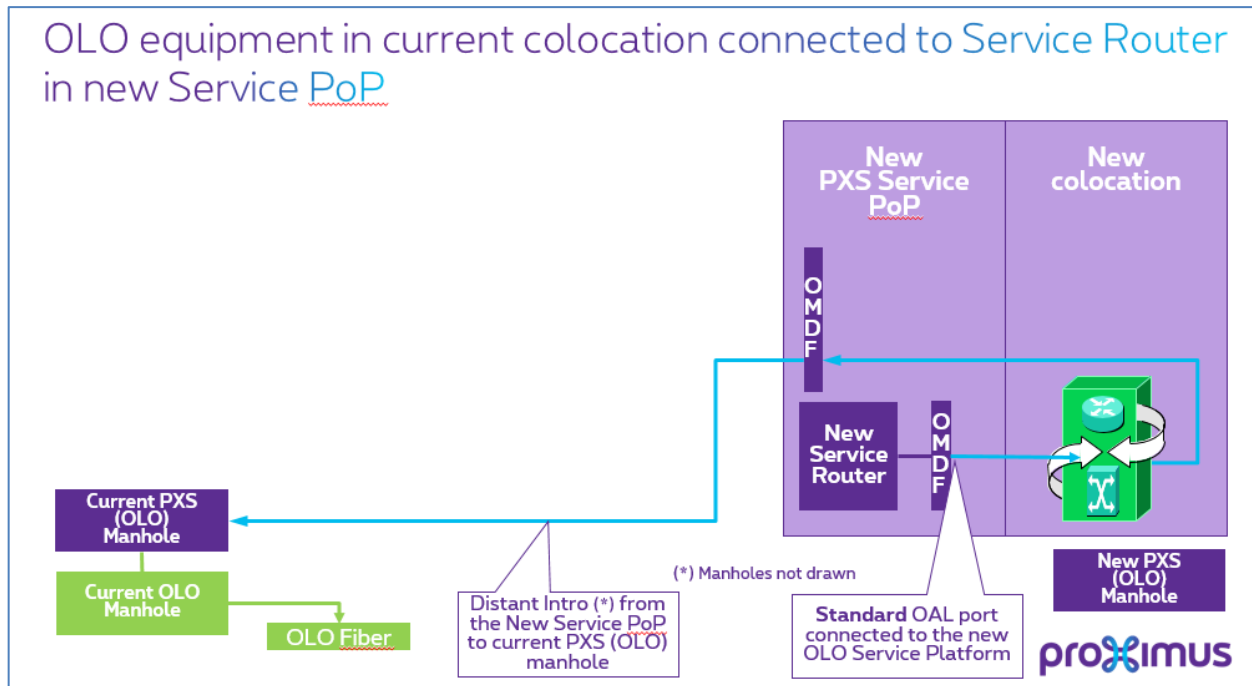
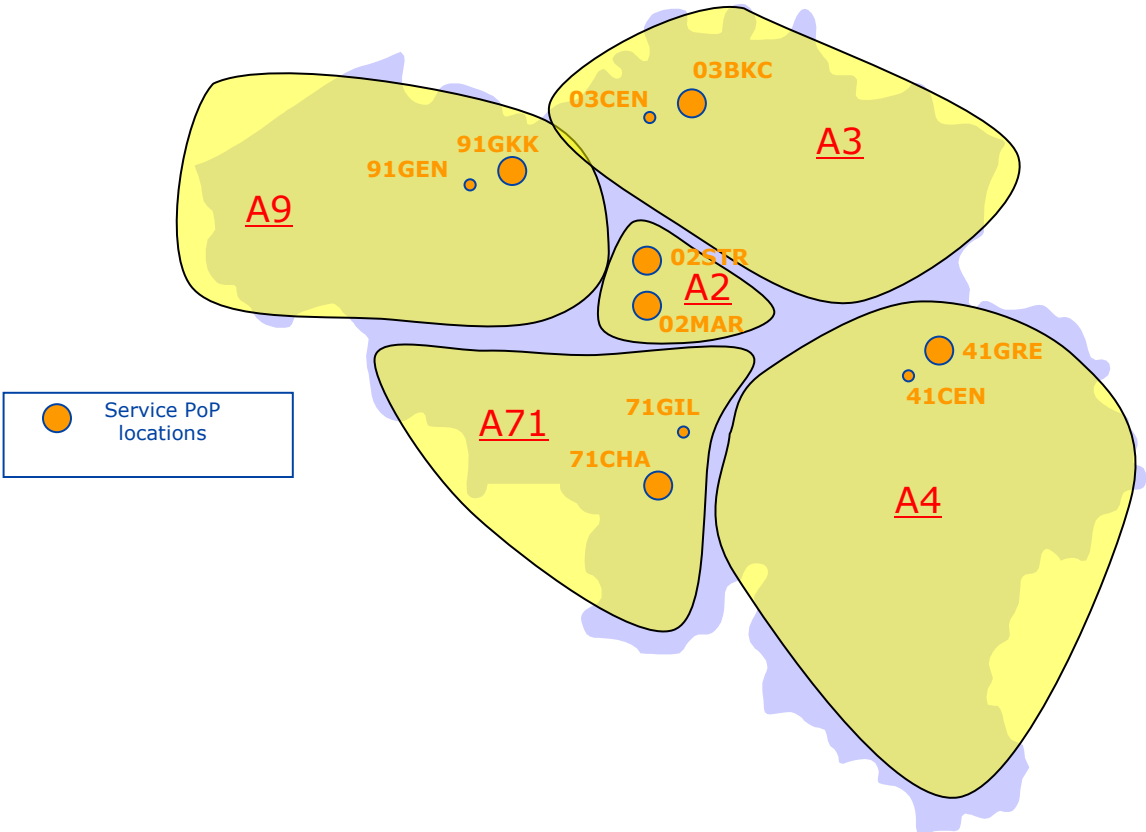


Figure 17: Final situation with Distant Intros in use

Appendix B: List of Service Areas and Service PoPs

a. Overview

5 Service Areas and 10 Service PoPs



b. Definition of the Service Areas

Service Area	Included Telephone Zones
A3:	03, 011, 012, 013, 014, 015, 016, 089
A2:	02
A4:	019, 04, 061, 063, 080, 081, 082, 083, 084, 085, 086, 087
A71:	010, 060, 064, 065, 067, 068, 069, 071
A9:	050, 051, 052, 053, 054, 055, 056, 057, 058, 059, 09

(*): For the sake of clarity, it is confirmed that the zone codes indicated above in the context of the present offer are limited to the numbers which identify fixed network termination points. In particular, 09 and 04 are respectively limited to the number series 092, 093 and 042, 043. As far as the code 080 is concerned, the numbers starting with 0800 are excluded.

c. List of Service PoPs

Area		City	Address	NCOW
A9	91GKK	Gent - Keizer Karel	Keizer Karelstraat 1	9265
A9	91GEN	Gent - Centrum	Sint Niklaasstraat 27	9223
A3	03CEN	Antwerpen - Centrum	Lange Nieuwstraat 106	3224
A3	03BKC	Antwerpen - Berchem	Karel Coggestraat 2	3227
A2	02MAR	Brussels - Marais	Rue du Marais - Broekstraat 72-74	2220
A2	02STR	Brussels - Paille	Rue Lebeau - Lebeauststraat 2	2513
A71	71GIL	Charleroi - Gilly	Sentier de la Limite 80	7141
A71	71CHA	Charleroi - Centre	Rue de la science 2	7127
A4	41CEN	Liège - Centre	Rue de l'université 30	4223
A4	41GRE	Liège - Grétry	Rue d'Harscamp 17	4349

As announced in the document "Network Transformation Outlook 2016-2021" (which is published on the Proximus wholesale website), the Service PoPs 03CEN and 91GKK will move to neighbouring villages. The Service PoP 03CEN ("Antwerpen-Centrum") with a "stop service" date of 30/06/2019 will move to 03WOM (Jacobsveldweg 15, 2160 Wommelgem). The Service PoP 91GKK ("Gent - Keizer Karel") with a "stop service" date of 30/06/2020 will move to 91WON (Zeeschipstraat 209, 9032 Wondelgem).

Appendix C: SRA and RTX explained (applicable to the Bitstream VDSL2 service)

a. Scope of this appendix

In order to benefit from the higher bit rates that are possible with the activation of Vectoring, as defined in G.993.5, on an optimum and reliable way, the combined activation of **Seamless Rate Activation (SRA)**, as defined in G.993.2 including latest amendments, and **Physical Layer Retransmission (RTX)**, as defined in G.998.4 (G.INP) including latest amendments, is required.

With the application of SRA and RTX, the behaviour of the line is very different than with **Legacy VDSL2**, where Legacy VDSL2 is considered as the VDSL2 operational mode without Vectoring, SAR and RTX.

This new behavior, where “new” is used as opposed to Legacy, is controlled and characterized by means of new configuration parameters, new operational parameters and new error counters. The purpose of this appendix is to provide some explanation on this.

b. List of SRA and RTX related parameters and counters

The following parameters and counters are explained in this appendix.

Configuration Parameters

- Maximum Net Data Rate (Max_NDR)
- Maximum Expected Throughput Rate (Max_ETR)
- Minimum Expected Throughput Rate (Min_ETR)
- Minimum INP SHINE (Min_INP_SHINE)
- Minimum INP REIN (Min_INP_REIN)
- Maximum delay
- Shine-ratio

Operational Parameters

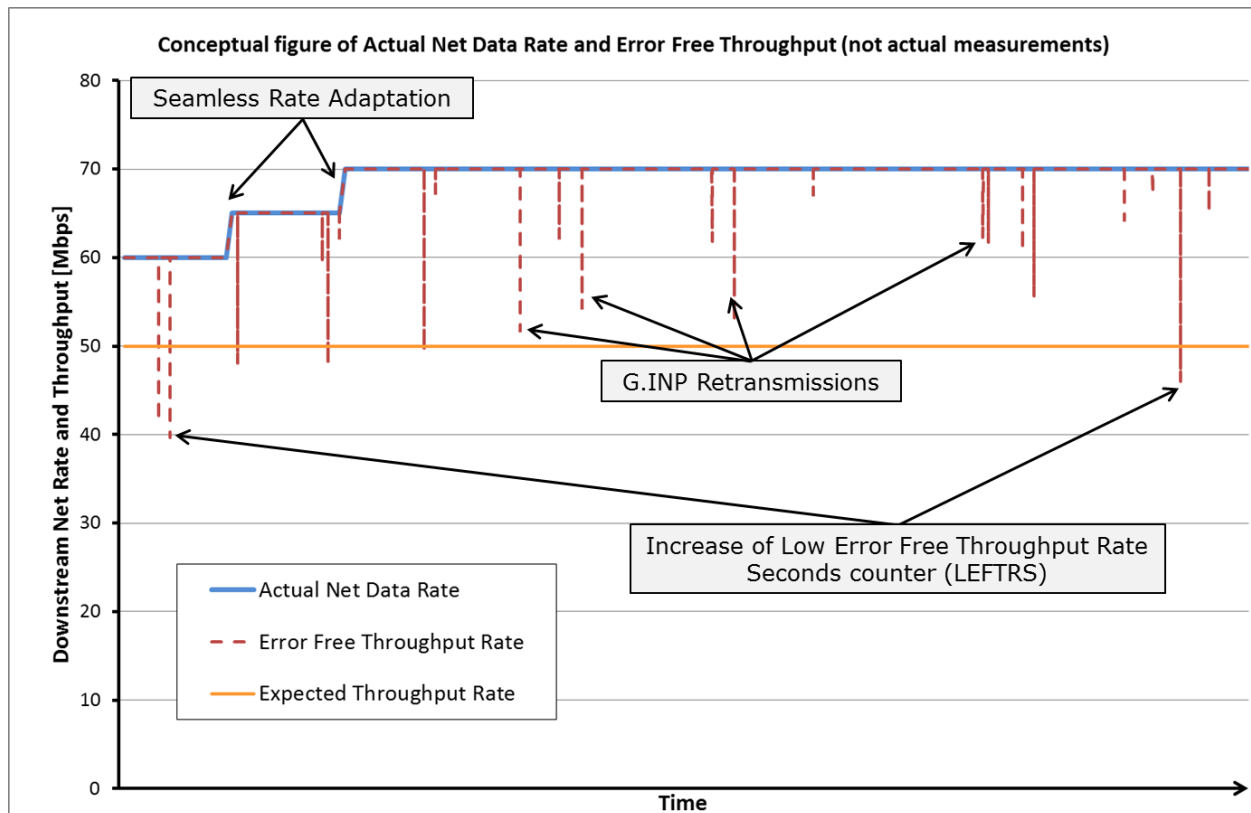
- Net Data Rate (NDR)
- Error Free Throughput Rate (EFTR)
 - Remark that, according to G.998.4, EFTR is not directly reported but is used in the definition of the other test parameters.
- Expected Throughput Rate (ETR)
- Attainable Net Data Rate
- Attainable Error Free Throughput Rate

Counters

- Low Error Free Throughput Rate Seconds (LEFTRS)
- Minimum Error Free Throughput Rate (Min_EFTR).

c. VDSL2 line behavior under SRA and RTX

As illustrated in the figure below, SRA and RTX have a great impact on the concept of bit rate and throughput.



The figure shows that the **Net Data Rate (NDR)** can vary over time thanks to the action of SRA. Typically for some lines into the vectoring systems the efficiency of the vectoring can still increase after entering into synchronisation thanks to a better estimation of the crosstalk channel. Therefore SRA is needed to benefit from this.

The Net Data Rate (NDR) will not increase above the configured **Maximum Net Data Rate (Max_NDR, 70Mbps in the figure)**.

With RTX activated, the Net Data Rate is the data rate available for both direct data transmission and the retransmission data, in case of errors. Therefore the resulting **Error Free Throughput** will always be smaller or equal to net data rate. Typically, as illustrated by the dashed red line of the above figure, in presence of burst of error there will be some retransmission and for a short period of time the error free throughput will drop.

In order to monitor the line quality and verify that the throughput is not excessively impacted by retransmission, the RTX standard G.998.4 (G.INP) has defined a new error counter, the **Low Error Free Throughput Rate Seconds (LEFTRS)**. The LEFTRS counts the seconds intervals where the Error Free Throughputs falls below 99,8% of a special value named the **Expected Throughput Rate (ETR)**.

Remark that when the LEFTRS will increase the Error Second (ES) counter will also be increased. Having ES errors without Code Violations and without any noticeable impact on the line will thus be perfectly possible into RTX mode.

It must be understood that the Expected Throughput Rate (ETR) is a very theoretical value that will not tell you much on the throughput actually available on the line. The only meaning of this parameter is to be a threshold to trigger LEFTRS errors.

The G.998.4 (G.INP) defines the ETR as being the minimum value between

- Configured **Maximum Expected Throughput Rate (Max_ETR)**
- $(\text{Net Data Rate}) * (1 - \text{RTxOH})$ where **RTxOH** is the Retransmission overhead needed to protect against the worst-case impulse noise environment as configured in the MIB and stationary noise

This means that ETR is essentially an arbitrary value defined by line configuration. Indeed:

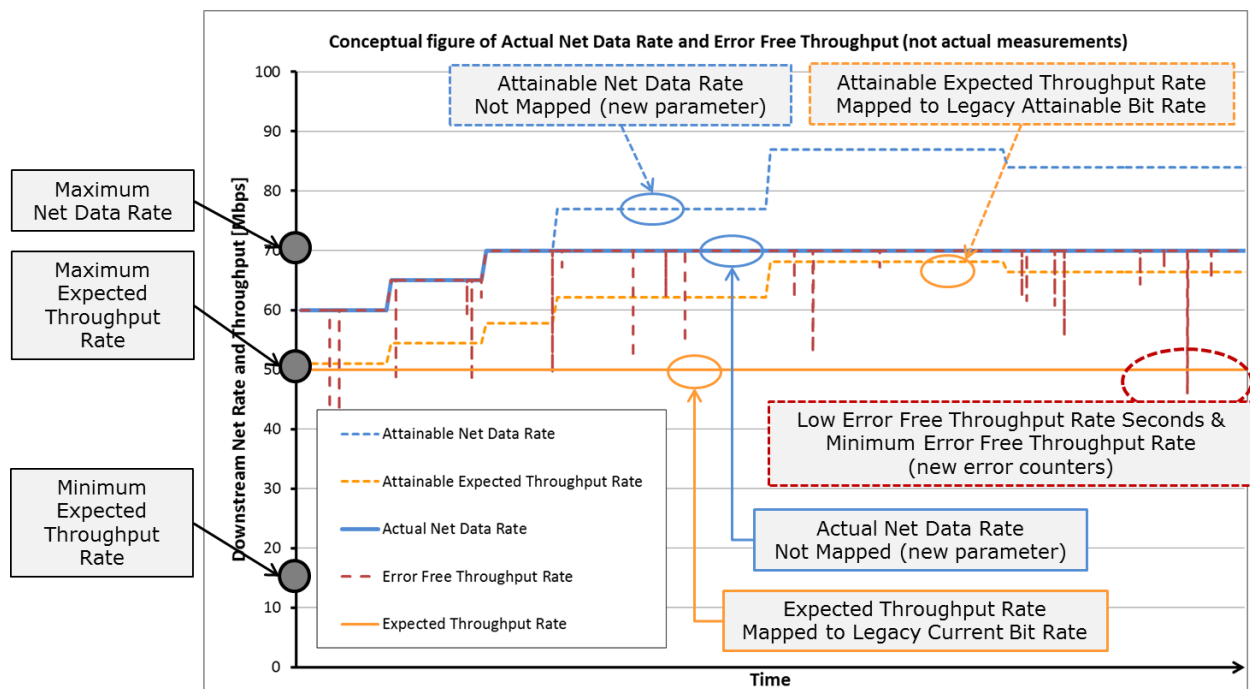
- Max_ETR is direct configuration data
- If one configures the system to be robust against an excessive combination of REIN and SHINE noises then automatically the retransmission overhead needed to protect against the worst-case impulse noise will be very high and ETR could be very low.
 - Remark that, the retransmission overhead is not used when not needed. So having a very big worse-case retransmission overhead has no direct impact on the error free throughput and shall not be seen as a drawback.

The **Minimum Expected Throughput (Min_ETR)** configuration parameter is defined in G.998.4 (G.INP) as the minimum allowed value for the expected throughput (ETR). So if ETR cannot reach the MINETR the line will not enter into synchronisation. This parameter is thus a replacement for the minimum target bit rate that is used in legacy VDSL2 Line Profiles (Legacy = No vector, no RTX).

The Minimum Expected Throughput Rate (Min_ETR) configuration parameter shall not be confused with the **Minimum Error Free Throughput Rate (Min_EFTR)** error counter that is just the minimum over a certain period of observation of the Error Free Throughput Rate.

d. Reading of Operational Parameters in SRA and RTX mode

Compared to the above figure, the figure below focuses more on the reporting of the SRA and RTX parameters and adds the configuration parameters, the Attainable Net Data Rate and the Attainable Expected Throughput Rate.



The meaning of the different parameters and their interactions are already explained above; the figure brings however the following new information:

- The Legacy concept of Attainable Bit Rate does not exist into RTX mode but the operational parameter used to report the Attainable Bit Rate will contain the Attainable Expected Throughput Rate.
- The Legacy concept of Current Bit Rate does not exist into RTX mode but the operational parameter used to report the Current Bit Rate will contain the Expected Throughput Rate.

Typically for an excellent line with a Net Data Rate at 75Mbps and an Error Free Throughput Rate always very close to 70Mbps, one will read a current bit rate of 50Mbps into the reporting tools. This may be very confusing.