

Reference Offer for Broadband Services (ROB)

Version 2.1.1

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Annex 1 :

Specifications for products as found in the previously available RDSLO Offer

Annex 2 :

Specifications for products as found in the previously available ORATH Offer

1. ROB Legal Terms

This Reference Offer for Broadband Services ("**ROB**") defines the terms and conditions, which shall apply and be granted by POST Technologies to Operators ("**Operators**") for the provisioning of POST Technologies' Broadband Services as required by Regulation ILR/T19/4.

All Schedules attached to this ROB form an integral part hereof and detail the different Broadband Services and their respective applicable provisioning terms offered by POST Technologies under this ROB.

The Co-location services as referred to from time to time in this ROB are part of and subject to the applicable Reference Co-location Offer ("**RCO**") and shall be provided by POST Technologies to the Operators in compliance with the specific terms and conditions of the said RCO.

As from the effective date of a Broadband Agreement the Operator is subject to this ROB and any of its subsequent and/or to any reference offers replacing it, as from their date of definitive publication in compliance with the applicable regulations and, more particularly, in compliance with Regulation 14/177/ILR.

This ROB does not purport to diminish the rights of Operators to seek additional services nor POST Technologies' obligation to provide additional services under applicable law.

Apart from this ROB, POST Technologies' commercial offers as well as any other valid and applicable reference offer(s), if any, are still available to the Operator on request pursuant to their respective terms and conditions.

Technical and financial specifications of the former RDSLO and ORATH products have been included as annexes in this ROB as POST Technologies continues to support existing services previously purchased under the terms of the RDSLO and ORATH reference offers. Requests for modifications, however, will require the migration of the existing service to a new service as specified in Schedule 2 of this ROB.

Converting ADSL-based RDSLO services, which have been provided in conjunction with analog or ISDN phone lines, into a new service as specified in Schedule 2 of this ROB, is a very time and resource consuming activity. Therefore POST Technologies will continue to provide support for these services during a minimum period of 5 years after the entry into force of the initial ROB on 1st October 2015.

The Operator having signed the Broadband Agreement should exercise its best efforts to also reduce its installed base of ADSL-based RDSLO services as quickly as possible and therefore has committed to the following migration plan :

- (i) 10% of its installed base until 30/09/2016;
- (ii) 30% of its installed base until 30/09/2017;
- (iii) 50% of its installed base until 30/09/2018;
- (iv) 70% of its installed base until 30/09/2019;
- (v) 90% of its installed base until 30/09/2020;

whereby "installed base" refers to the number of active ADSL-based RDSLO services of the concerned Operator on 31/12/2015.

If the Operator meets or exceeds the targets at the end of each period, its remaining ADSL-based RDSLO services will continue to be billed according to the terms and conditions set in Annex 1.

In case the Operator does not reach the committed target at the end of a period, the amount of ADSL-based RDSLO services required to meet the defined quota will be billed monthly according to the tariffs foreseen in paragraph 6.1.2.1 of this ROB for the "Bitstream Service Fix 20" instead of the tariff for the "Residential Light", "Residential Medium" or "Residential Large" services, as found in Annex 1, until the Operator reaches again the defined target.

In all other cases RDSLO and ORATH services will continue to be billed according to the terms and conditions of Annexes 1 and 2 of this ROB.

1.1. Services covered

This ROB defines the minimal terms and conditions for Broadband Services which POST Technologies will grant to Operators.

Nevertheless, POST Technologies reserves the right to provide more beneficial terms and conditions on a commercial basis, in accordance with the applicable regulatory framework, including the principle of non-discrimination.

The Broadband Services covered by this ROB are:

- (i) Bitstream Services,
- (ii) EtherConnect Services and
- (iii) RDSLO and ORATH services as described in Annexes 1 and 2.

A detailed description of these services is provided in Schedule 2 - Broadband Service Description and Annexes 1 and 2.

Broadband Services delivery and operations by POST Technologies shall be in accordance with the applicable Technical Information, as provided by POST Technologies to the Operator, which shall conform to the general principles set out in and form integral part of the ROB.

1.2. Definitions and Interpretation Rules

1.1.1. Definitions

Unless expressly stated otherwise

- (i) references to an article are references to an article of the ROB, while references to clauses, schedules and annexes are to the clauses, schedules and annexes of the ROB; references to paragraphs are to paragraphs of the relevant schedule;
- (ii) reference to a person includes a natural person, corporate or unincorporated body (whether or not having separate legal personality), while references to a statute or statutory provision is a reference to it as it is in force for the time being, taking account of any amendment, extension or re-enactment and includes any subordinate legislation for the time being in force made under it;
- (iii) a reference to one gender shall include a reference to the other genders and vice versa;

- (iv) words in the singular shall include the plural and vice versa, while references to a gender include any other gender;
- (v) writing or written includes faxes but not e-mail, except if specifically specified in this ROB or in the Broadband Agreement;
- (vi) where the words "include(s)", "including" or "in particular" are used, they are deemed to have the words "without limitation" following them. The words "other" and "otherwise" are illustrative and shall not limit the sense of the words preceding them;
- (vii) any obligation in the ROB or the Broadband Agreement on a person not to do something includes an obligation not to agree or allow that thing to be done.

1.1.2. Interpretation Rules

To the extent that they are consistent with and the subject-matter of the provisions concerned have not been replaced by the terms of the ROB and/or the Broadband Agreement, the general conditions of POST Technologies, which can be consulted on POST Technologies' Website, will apply to the provision of the Broadband Services.

Unless expressly defined otherwise hereafter (in particular in Schedule 1 - Glossary below), the terms used in this ROB shall be construed and interpreted in accordance with the Law of February 27th, 2011 on and Electronic Communication Networks and Services and its implementing regulations.

1.3. Term

This ROB is valid as from the date of its definitive publication in accordance with Regulation 14/177/ILR unless the ILR advises otherwise or unless

- (i) a new ROB is published or adopted by POST Technologies, in compliance with Regulation 14/177/ILR, or
- (ii) a material change occurs in the laws or regulations with respect to electronic communication services and networks in Luxembourg and this only to the extent that such a material change would render the ROB inapplicable or unenforceable.

1.4. Amendments

In accordance with Regulation 14/177/ILR the content of this ROB may be timely reviewed and amended in order to comply with applicable rules and regulations. However, amendments to the general conditions of POST Technologies and to the Technical Information can be made in accordance with the amendment provisions set forth therein.

Furthermore, ILR has the right to request or impose on POST Technologies modifications to the applicable ROB or the adoption of a new ROB to be undertaken by POST Technologies in compliance with the applicable procedural rules and regulations.

1.5. ROB Tariffs

All ROB Tariffs, including those specified in the Schedules and Annexes attached hereto, are in EURO (€) and exclusive of Value-Added Tax (VAT) or any other legal taxes, which will be added where applicable. Please refer to Schedule 6 - Tariffs and Annexes 1 and 2.

POST Technologies may revise the ROB Tariffs at any time after having definitively published the reviewed ROB Tariffs in accordance with Regulation 14/177/ILR.

If any ROB Tariff or the means and/or methods of calculating such ROB Tariff is subject to a legal review by the ILR or with any other administrative or judicial authority, the concerned ROB Tariff or the concerned calculation method shall be treated as valid until the final conclusion of the legal review, unless the competent authority directs otherwise. If an authority finds a ROB Tariff or a ROB Tariff calculation method to be unlawful then POST Technologies shall make any necessary alterations to ROB Tariffs for the future.

1.6. Billing

The Operator undertakes to pay all invoices in relation to this Broadband Agreement in EURO (€) and within the payment period specified on the relevant invoice(s), it being specified that the Operator shall pay to POST Technologies all due amounts as set forth above irrespective of (i) the billing by the said Operator to its own End User and/or of (ii) the payment by the End User(s) of the services provided to them by the Operator on the basis of or in relation to the Broadband Services or any other telecoms service(s) provided by POST Technologies to the Operator.

Upon POST Technologies' request, the Operator shall provide an irrevocable and unconditional bank guarantee issued in favour of POST Technologies by an EU financial institution for an amount of at least 50.000 €

- (i) before POST Technologies' acceptance of any order in case the Operator's creditworthiness appears to be not sufficient for the Broadband Services to be provided by POST Technologies; or in case
- (ii) the Operator has had repetitive credit defaults in the past towards POST Technologies, whichever may be the type of services concerned;
- (iii) the Operator fails to make payment to POST Technologies of any undisputed amount when due in relation to the Broadband Services; or
- (iv) in case the Operator has a material, negative change in its financial conditions and/or creditworthiness.

The above-mentioned guarantee shall be issued for a period equivalent to the duration of the Broadband Agreement, but may be extended having regards to the circumstances upon POST Technologies' request. When, and as long as serious and ascertained doubts exist regarding the Operator's creditworthiness or solvency, POST Technologies may without prejudice to previous arrangements require payment in advance.

1.7. Parties' Obligations

1.7.1. POST Technologies shall be responsible for

- (i) the Network used to provide the Broadband Services from the End User's NTP, FO-NTP or ONT to the POI;
- (ii) connecting or disconnecting Broadband Access lines further to and in compliance with valid Operator's confirmed orders submitted to POST Technologies in accordance with Schedule 3 – Planning, Ordering and Provisioning;
- (iii) informing the Operator on system alterations to be made in POST Technologies' Network and having a potential effect on the services offered by the Operator in compliance with Article 2.5 - Scheduled System Alteration below;

- (iv) the maintenance of the Broadband Services between the POI with the Operator and the demarcation point on the End User's premises. In no case shall POST Technologies be responsible for bad cabling connections between the network termination points (NTP/FO-NTP/ONT) and the NTU or modem acting as a demarcation point.

POST Technologies shall not be responsible for the performance and follow-up of any service that the Operator operates on a Broadband Access and provided to the latter as part of the Broadband Services.

POST Technologies shall in no case be obliged to expand, modify or condition in any way POST Technologies' Network in whole or in part, to provide any part of the Broadband Services, unless expressly agreed otherwise in the Broadband Agreement and only to the strict extent as specifically agreed upon by and between the Parties or as imposed by the ILR.

Request for new connections to existing and/or new buildings shall be handled pursuant to Schedule 3 - Planning, Ordering and Provisioning.

1.7.2. The Operator shall at least be responsible for the following :

- (i) ordering or terminating, as the case may be, a Broadband Service in accordance with Schedule 3 - Planning, Ordering and Provisioning;
- (ii) using exclusively telecommunications terminal equipment compliant with "Règlement grand-ducal du 4 février 2000 concernant les équipements hertziens et les équipements terminaux de télécommunications et la reconnaissance mutuelle de leur conformité" and any subsequent regulations replacing or amending this regulation, as well as with any specifications provided by POST Technologies in accordance with the terms of this ROB;
- (iii) conducting appropriate fault testing and timely producing associated Fault Reports to evidence faults in the POST Technologies' Network in accordance with this ROB and in particular with Schedule 4 - Fault Repair and Reporting;
- (iv) complying with any obligations of or related to legal interception;
- (v) informing the relevant End User about all technical modifications required on his/her existing installation and the service impacts that might occur; and
- (vi) tracking POST Technologies' system alteration activities as well as achieving relevant steps and actions in due time in order to make sure that the End User's services are maintained;
- (vii) notifying POST Technologies in writing of its contact details relevant for or in relation to the Broadband Services as of the signature date of the Broadband Agreement as well as notify any change thereto to POST Technologies in due time and in any case sufficiently in advance in compliance with the Broadband Agreement.

1.7.3. No Operator (including POST Technologies) shall be responsible for the content of IP traffic or transactions passed through its own or an Operator's network (including POST Technologies' Network). Laws and regulations regarding confidentiality and access by legal authorities to traffic or transactions on the Operator's and POST Technologies' network will apply.

1.8. POST Technologies' General Powers

- 1.8.1. POST Technologies may refuse to grant access to any Broadband Services to any Operator for justified technical constraints or the necessity to warrant POST Technologies' Network's integrity. Any decision to refuse to grant access will be notified to the ILR.
- 1.8.2. Occasionally, POST Technologies, acting reasonably, may suspend in whole or in part the Broadband Services for any of the following reasons:
 - (i) if required by any administrative or judicial authority duly authorised and empowered to do so, or
 - (ii) for maintenance reasons, network adaptations and/or in case of any usage creating perturbations or disruptions of any part of the Broadband Services or of any other service(s) using the same infrastructure.
 - (iii) in order to ensure the general availability of the Broadband Services.
- 1.8.3. Wherever possible, POST Technologies will give the Operator reasonable written notice before performing any of the actions related to the above and POST Technologies will do its best efforts to restore Broadband Services as soon as possible after the concerned temporary suspension.
- 1.8.4. POST Technologies shall have the right to disconnect any equipment or any part of it without prior reference or notice to the Operator if at such time, in POST Technologies' reasonable opinion it is exposing or could expose any person to any danger of death or injury.
- 1.8.5. Without prejudice to the foregoing clause, POST Technologies shall have the right to request the Operator to disconnect any equipment or any part of it within a reasonable time period, if, at such time, in POST Technologies' reasonable opinion, it is causing, suspected of causing or could cause damage to the Network or if such exposure or damage is or may be imminent, POST Technologies will immediately notify the Operator of the circumstances in which such compliant equipment has to be disconnected. If the Operator has not disconnected the concerned equipment within a reasonable time period, POST Technologies shall have the right to disconnect itself the concerned equipment after prior notification thereof to the Operator.
- 1.8.6. POST Technologies shall not be liable to the Operator for any loss, damage or injury arising due to POST Technologies' action in disconnecting the equipment or for any interruption to the service provided by the Operator using the equipment howsoever caused, except where the loss damage or injury is caused directly due to POST Technologies' gross negligence.
- 1.8.7. In the event of a disconnection in accordance with the above, the Operator shall not reconnect the equipment until the reasons for its disconnection have been fully remedied. In case the danger or threat referred to above is caused directly due to POST Technologies' negligence, then POST Technologies shall reimburse to the Operator the evidenced reasonable direct costs of reconnecting the equipment.

1.9. Limitation of Liability

- 1.9.1. POST Technologies has no obligation of any kind to the Operator beyond the obligations to exercise the reasonable skill and care of a competent telecommunications operator in performing its obligations under the ROB and the Broadband Agreement.

- 1.9.2. Neither Party undertakes any liability for the acts or omissions of a third provider of telecommunications services, nor shall be held liable for such act or omission. As a consequence, the Party affected by such an act or omission shall carry out all appropriate rights and measures against the concerned third party provider of telecommunications services, without involving the other Party, while the latter will, if appropriate having regards to the circumstances, reasonably cooperate with the concerned other Party in relation to the above.
- 1.9.3. Neither POST Technologies nor the Operator excludes or restricts its liability for death or personal injury caused by its own negligence or liability.
- 1.9.4. POST Technologies will not be liable to the Operator for any claims, proceedings or actions brought or made against POST Technologies by any of the Operator's End Users, it being specified that in such case the Operator shall keep POST Technologies free and harmless of any such claims, proceedings or actions.
- 1.9.5. Neither Party shall be held liable to the other in contract, tort or otherwise, to the fullest extent permitted by law, for indirect or consequential damage or any other loss of profit whatsoever arising in connection with the implementation of this ROB and the relevant Broadband Agreement, howsoever caused.

1.10. Property

All relevant infrastructures and equipment used by POST Technologies for the provision of Broadband Services to the Operator remain and shall remain the integral property of POST Technologies.

The Operator shall be responsible for any equipment put at disposal by POST Technologies and must take reasonable steps to ensure that nobody (other than someone expressly authorised by POST Technologies) adds to, modifies or in any way interferes with it. The Operator will be liable to POST Technologies for any loss of or damage to POST Technologies' equipment, except where such loss or damage is due to fair wear and tear or is caused by POST Technologies, or anyone acting on POST Technologies' behalf.

Any software and/or user manuals provided or made available by POST Technologies to the Operator in relation to any part of the Broadband Services :

- (i) are and shall remain protected by applicable copyright law and as such, any copy, translation, transcription, bearing, correction, integration modification thereof, whichever may be the type, support, way and/or extend thereof, either by the Operator or by an End User, is strictly prohibited; and
- (ii) shall remain the exclusive property of, as the case may be, POST Technologies or any third party having title thereto.

The Operator expressly undertakes to take and/or cause to take all and all necessary or appropriate steps and measures to prevent any breach of the above provisions.

With the cessation of any part of the Broadband Services either by the Operator or by a specific End User, whatever the reason, any usage rights of the Operator on that relevant infrastructure, software and/or user manuals shall automatically expire on the effective cessation date of the Broadband Services, without POST Technologies having to carry out any specific steps in relation

thereto and/or for that specific purpose and without prejudice to the right of POST Technologies to recover any physical elements that are its property.

1.11. Information Exchange, Confidentiality

1.11.1. In order to implement the ROB and the Broadband Agreement, POST Technologies and the Operator will have to exchange information and the disclosing Party undertakes to use reasonable endeavours to ensure that the information disclosed is correct to the best of its knowledge at the time of such information provision.

1.11.2. The POST Technologies Staff is under professional secrecy. This legal obligation binds the personnel to secrecy concerning the Operator, as well as its services and data (including those of its End Users).

1.11.3. With respect to each and any Confidential Information provided by either Party (the "Disclosing Party") to the other (the "Receiving Party") in relation to this Agreement, the Receiving Party undertakes to :

- (i) hold such Confidential Information in confidence and protect it with the same degree of care with which it protects its own Confidential Information of equivalent importance, but in no event less than reasonable care;
- (ii) use such Confidential Information only in pursuance of its business relationship with the other Party and its Affiliates as well as in relation to the Broadband Agreement and/or the Broadband Services;
- (iii) not copy or otherwise duplicate in whatever form and on whatever support or mean either known or unknown to date (e.g. in written, pictorial, floppy disks, magnetic disks, optical disks or other tangible form) such Confidential Information or knowingly allow anyone else to access, copy or otherwise duplicate any of such Confidential Information under its control without the Disclosing Party's prior written approval (which shall not be unreasonably refused, delayed or conditioned), except as regards to Authorised Persons as defined below;
- (iv) restrict access to and disclosure of such Confidential Information solely to those of its employees (including its management and directors), external advisors and/or consultants and any of those of its Affiliates and/or of those of its Subcontractors with a strict need to know and directly involved in the implementation of this Agreement and/or in the provision of any part(s) of the Services (collectively the "Authorised Person(s)"), and not to disclose Confidential Information to any third parties (including, without limitation, any of its other agents, consultants and/or subcontractors not being Authorised Persons); as well as
- (v) require that all Authorised Persons to which access to the Confidential Information has been or will be granted or given duly agree to maintain the confidentiality thereof, and specifically to comply with the provisions set forth herein by contract, work rules or other appropriate methods at the Receiving Party's option; and
- (vi) not analyse or reverse engineer for composition of any Confidential Information, nor assist others to disassemble, decompile, reverse engineer or otherwise attempt to recreate the Confidential Information.

1.11.4. Each Party shall take all reasonable steps and measures to :

- (i) avoid disclosure, dissemination and more generally unauthorised access to or use of Confidential Information, which shall comply with the measures it usually takes to

protect its own confidential information or its information of a similar nature and in any case take not less than reasonable care; and

- (ii) segregate Confidential Information from third parties' confidential materials, in particular to prevent commingling; and
- (iii) at its sole expense and including but not limited to court proceedings, to restrict its Authorized Persons from prohibited or unauthorized disclosure or use of the Confidential Information as well as to make each of them sign individual secrecy commitments at least equivalent to those contained in the Broadband Agreement.

1.11.5. This Article 1.11 shall nevertheless not prevent or refrain any Party from complying with its legal information obligations.

1.11.6. The Receiving Party may in particular disclose Confidential Information to European or national competent governmental or administrative authorities to the extent strictly necessary to ensure compliance with any law. In case Confidential Information is to be communicated pursuant to the requirement of law, regulation, judgment, order from any competent administrative authority or judicial body and/or request for the needs of any proceedings with any courts or administrative authorities, having the right to request the disclosure of such a Confidential Information, the Receiving Party shall, to the extent permitted by any applicable law or the relevant regulation, authority or body, notify such request for disclosure to the Disclosing Party without undue delay upon receipt thereof so that the Disclosing Party may, at its sole discretion and costs, seek protective order, confidential treatment and/or other appropriate remedy.

In any case, the Receiving Party shall be entitled to disclose such Confidential Information as strictly requested by the relevant authority, provided it duly specifies to the said authority at the time of such disclosure the confidential nature of such Confidential Information and takes all relevant steps to ensure due protection thereof to the widest extent possible.

1.11.7. The Receiving Party shall notify to the Disclosing Party, immediately upon discovery or knowledge thereof, any unauthorised use, access and/or disclosure of any Confidential Information or any other breach of this Article 1.11 and undertakes in such a case to (i) reasonably cooperate with and support the Disclosing Party and/or its Affiliates to protect its/their rights and when relevant to regain possession of such Confidential Information as well as to mitigate the consequences of such unauthorised use, access and/or disclosure, to (ii) take out and achieve without undue delay all appropriate and relevant steps and measures to prevent further unauthorised use, access and/or disclosure of the Confidential Information or part thereof and to (iii) take appropriate defensive measures against any claim of infringement, in accordance with the reasonable instructions of the Disclosing Party.

1.11.8. All Confidential Information shall remain the property of the Disclosing Party and/or as relevant of the owner of the concerned Confidential Information.

1.11.9. The Parties agree that the provisions strictly relating to confidentiality set forth in this Article 1.11 shall survive any termination of the Broadband Agreement, whichever may be the ground, for a three years (3) period as from the effective termination date of the Broadband Agreement.

1.11.10. The Parties hereby declare and warrant that they comply with data protection and privacy laws, and any other laws in relation to the Broadband Services, to the extent applicable to them. Each Party particularly undertakes to (i) comply with the legislation in force

relating to personal data protection and computer security, including in particular the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation), the law of 1 August 2018 on the organization of the National Commission for Data Protection as well as the amended law of 30 May 2005 on the protection of privacy in the electronic communications sector (ii) hold and maintain such security infrastructure and organization as relevant or necessary to comply with and reasonably carry out its rights and obligations pursuant to this Agreement under optimum safety condition and in compliance with applicable laws.

2. ROB Operational Terms

2.1. The Broadband Services shall:

- (i) be provided by POST Technologies to an Operator in accordance with the terms and conditions of this ROB;
- (ii) consist of and include the provisioning by POST Technologies to an Operator of:
 - a. service to enable the Operator to provide electronic communications and/or telecommunications services to End Users,
 - b. interconnection between POST Technologies' and the Operator's network at the POI (RHD) for the handover of the aggregated traffic flows for the services provided to the operator in the context of this ROB, or
 - c. maintenance and fault clearance for the provided services; and
- (iii) be provided only on a fibre line or a copper line where POST Technologies' Network allows provision of fibre respectively xDSL services.

2.2. Quality of Service – Service Level Agreement (SLA)

The Service level set out in Schedule 5 - Service Level Agreement attached hereto shall apply to the provision of the Broadband Services, while the said Service level shall not apply in case of any Force Majeure event.

2.3. System Protection

Each Party is responsible for the safe operation of its respective system and shall take all reasonable and necessary steps and measures in its operation, implementation and maintenance to ensure that its system does not

- (i) endanger the safety or health of employees, contractors, agents or End Users of the other Party, nor
- (ii) damage, interfere with or cause any deterioration in the operation of the other Party's system or a third party operator's system.

2.4. Configuration and Technical Constraints

- 2.4.1. Broadband Access lines will be provided in accordance with the technical constraints specified in Schedule 2 - Broadband Service Description.
- 2.4.2. POST Technologies shall in no case be liable for any shortage of access lines or cable saturation, e.g. due to broadband usage.

2.5. Scheduled System Alteration

- 2.5.1. Scheduled system alteration with major impact

When POST Technologies wants to make a system alteration which may reasonably have a major impact on the proper provision of the Broadband Services under this ROB to one or several Operator(s), it shall give to the concerned Operator(s) a minimum two (2)-

month written notice prior to the foreseen date of the anticipated system alteration, which shall specify the technical details of the contemplated system alteration and the foreseen date of the said anticipated system alteration.

Following such notification, POST Technologies shall provide to the Operator additional information, as the Operator may reasonably request, including, to the extent reasonably practicable, the potential impact thereof on the service(s) provided by the Operator to the End Users.

Upon an Operator's express request, POST Technologies will grant access to a special test platform where the said Operator can test the compatibility of its Active Equipment with the latest software version applied in POST Technologies' Network.

2.5.2. Scheduled system alteration without major impact

When POST Technologies wants to make a system alteration which may reasonably not have a major impact on the proper provision of the Broadband Services under this ROB to one or several Operator(s), it shall give to the concerned Operator(s) a prior notice having regards to the circumstances which shall in no case be less than three (3) business days prior to the foreseen date of the said anticipated system alteration. Such notification shall specify the technical details of the contemplated system alteration, the foreseen date of the related works and the reasonably foreseeable impact of the said works on the Broadband Services provisioning.

2.6. Works or Intervention due to a POST Technologies Network Failure or an Emergency Case

In case POST Technologies has to intervene on its network further to a network failure or an emergency case, POST Technologies will do its best efforts to limit the time of its intervention having a possible impact on the provisioning of the Broadband Services to the reasonable minimum time having regards to the circumstances. In any case, POST Technologies will inform the Operators of such an intervention as soon as reasonably possible, while the restoration of the service provisioning on POST Technologies' network shall be the priority.

2.7. Coordination between the Parties

2.7.1. POST Technologies will put into place entities in order to manage provisioning, maintenance and fault repair of the Broadband Services, which will be accessible from 8:00 to 12:00 and from 13:00 to 17:00 from Monday to Friday, except on legal, public and usage holidays in Luxembourg.

2.7.2. The contact details of these entities will be published on POST Technologies' Website and shall be the exclusive contact points for any and all Operator's handling questions regarding the operational management of the Broadband Services.

2.7.3. The Operator undertakes to (i) contact only POST Technologies' contact points as specified here above and to (ii) provide its own contact points for the management of Broadband Services, including for questions regarding operational subjects.

2.7.4. POST Technologies' and the concerned Operator's respective contact points in relation to this ROB and to the provision and maintenance of the Broadband Services are or, as the case may be, will be specified in the concerned Broadband Agreement. In addition POST

Technologies will publish its contact points on POST Technologies' Website, while the later version thereof shall always prevail over older ones.

- 2.7.5. The exchange of information related to the ordering process for Bitstream Services shall be done exclusively by means of a Web Service Application. The Operator shall commit to use said Web Service Application for the submission of all orders related to Bitstream Services and to comply with all of POST Technologies' procedures regarding the use of this Web Service Application and the structure of its messages. Related specifications can be found on POST Technologies' Website.

2.8. Relations with End Users and Branding

2.8.1. End Users

Without prejudice to the applicable regulatory framework, POST Technologies will not undertake customer handling/care of the Operator's End Users.

The Operator undertakes not to include in the contractual terms with its End Users conditions that are not consistent with the terms of the ROB. The Operator shall be solely liable and responsible for any contractual terms and conditions that the Operator may offer to its End Users beyond the specifications of the Broadband Services.

2.8.2. Branding

The Parties agree not to offer any Broadband Service under any brand, including any trademark, trade name or company name of the other Party unless the use of the brand(s) of the other Party is expressly agreed upon in writing between the Parties. Such use of the brand will then be strictly limited to the service at stake.

POST Technologies is allowed to use, for all interventions in the context of this ROB, its normal vehicles and staff uniforms with all advertising on them as for its own products and services.

The Operator is not allowed to attach any branding or advertising signs on POST Technologies' equipment and infrastructure, neither in POST Technologies' sites nor in End User's sites.

3. Procedure for reaching a Broadband Agreement

Broadband Agreements will be negotiated and entered into, based on the standard terms and conditions, pursuant to and in compliance with the applicable legislation and POST Technologies shall endeavour its best efforts to conclude a Broadband Agreement in no more than fifteen (15) days after receipt of a valid request.

Any request for entering into a Broadband Agreement with POST Technologies under this ROB must be made in writing and per registered mail to the following address:

POST Technologies
Wholesale & Corporate Functions
2, rue Emile Bian
L-1235 Luxembourg
Tel: +352 49 91 1

Schedule 1 Glossary

Access Line	Refers to the physical line (i.e. copper pairs or optical fibres) between the NTP or FO-NTP at the End User's premises and the DSLAM, OLT or other aggregation node in POST Technologies' Network
Active Equipment	Equipment located at the End User's premises owned by either the Operator or the End User and used for circuit termination and delivery of Operator's services (e.g. modem, router, HAG, Set-Top Box) as well as the End User's application equipment (e.g. PC)
ADSL	Asymmetric Digital Subscriber Line
ATH (or "Accès Très Haut débit")	ATH services are defined in the ORATH
Area POP	Site where the point-to-point FTTH fibre infrastructure is terminated and where POST Technologies' and Operators' infrastructures share the same room. Existing Local Exchanges can also serve as Area POPs.
Bitstream Service(s)	Service for providing broadband connectivity to End Users as defined in this ROB
Broadband Agreement	The agreement that must be concluded between POST Technologies and the Operator in order to make the terms of the ROB binding upon the Operator in view of the provision of Broadband Services by POST Technologies and any specific services and features ancillary to the Broadband Services if expressly agreed therein by the Parties
Broadband Service(s)	Refers to (i) Bitstream Services and EtherConnect Services as described in Schedule 2 (ii) RDSLO and ORATH services as described in Annexes 1 and 2 In <u>Schedule 2 and 3</u> the term Broadband Services only covers the Bitstream Services and/or EtherConnect Services, while RDSLO and ORATH services, if concerned, are mentioned explicitly.
Broadband Services KPI(s)	The key performance indicator(s) applicable to Broadband Services as expressly listed in article 4 (6) of the Regulation ILR/T19/1 (or any subsequent ILR regulation(s) amending such list in whole or in part)
Business Day(s)	Any days of the week in Luxembourg under exclusion of Saturday, Sunday as well as any public, statutory or bank holiday in the Grand-Duchy of Luxembourg.
Business Hour(s)	Any hour between 08:00 and 12:00 and between 13:00 and 17:00 on Business Days
CBS	Committed Burst Size – Maximum number of bytes available for a burst of Ethernet Frames sent at interface speed to remain CIR-conformant
CIR	Committed Information Rate – Bandwidth up to which the network delivers Ethernet Frames and is committed to meeting the performance objectives
CLRO	Commercial Line Rental Offer
CoS	Class of Service
Confidential Information	Includes, without limitation, a. all non-public information relating the technology, infrastructure, customers, business plans and business models, tariffs and prices, promotional and marketing activities, strategy, finances, and other business affairs, possible routes, needs, constraints and/or requirements, offers and/or potential or possibly involved Subcontractors or providers relating to any Party and/or its Affiliates; b. all third party information that the concerned Party and its Affiliates are obliged to keep confidential; as well as c. any possible combination of any of the above and excludes information which

	<p>a. was in the legitimate possession of the Receiving Party (as defined below) at the time of its disclosure by the Disclosing Party (as defined below) or corresponds in substance to information developed by the Receiving Party, as it can be demonstrated on the basis of previously existing documents, and which was not previously acquired from the Disclosing Party on a confidential basis;</p> <p>b. was in the public domain at the time of its disclosure by the Disclosing Party to the Receiving Party, as it can be demonstrated on the basis of published documents which were generally available prior to the disclosure of the relevant information;</p> <p>c. is considered to be part of the public domain subsequent to its disclosure by the Disclosing Party to the Receiving Party, as it can be demonstrated on the basis of documents which were published and are generally available through no act or failure to act of the Receiving Party; and</p> <p>d. was disclosed by a third party to the Receiving Party without restriction on disclosure or use, unless the Receiving Party had actual knowledge that the third party acquired possession of it unlawfully or by a breach of contract or a fiduciary relationship.</p>
CPE	Customer Premises Equipment
Donor Operator	The Operator from which an End User's Bitstream Service is migrated to a Recipient Operator
DSLAM	Digital Subscriber Line Access Multiplexer
EBS	Excess Burst Size – Maximum number of bytes available for a burst of Ethernet Frames sent at interface speed, but without any performance objectives
EIR	Excess Information Rate – Bandwidth up to which the network delivers Ethernet Frames, but without any performance objectives
EtherConnect Service	Service for providing broadband connectivity to End User's as defined in this ROB
End User	Any natural or legal person with whom the Operator has entered into an agreement for the provision of publicly available telecommunication services
EPT	Entreprise des Postes et Télécommunications, an autonomous « Etablissement Public » created by the « <i>Loi du 10 août 1992 portant création de l'Entreprise des Postes et Télécommunications</i> » as further modified
FO-NTP	Fibre Optic Network Termination Point, the termination point of the fibre optic section of POST Technologies' Network at the relevant End User's premises
Force Majeure	A force majeure event as defined in the GTCS of POST Technologies
FTTH	Fibre To The Home – POST Technologies' high-density fibre network for the universal fibre coverage of Luxembourg
FTTO	Fibre To The Office – POST Technologies' purpose-built fibre network providing connectivity for corporate customers
G.fast	xDSL technology targeting speeds of up to 1 Gbps at short distances
GPON	Gigabit Passive Optical Network
GTCS	POST Technologies' General Terms and Conditions for Sale in force, which can be consulted on POST Technologies' Website
HAG	Home Access Gateway
ILR	<i>Institut Luxembourgeois de Régulation</i> , the national regulatory authority in Luxembourg, in particular in the field of electronic communications networks and services
Intellectual Property Rights	Means all rights in inventions, patents, copyrights, design rights, trademarks and trade names, trade secrets, know-how and other rights having a similar

	effect (whether registered or unregistered) and all applications for the same anywhere in the world
IP	Internet Protocol
ISDN	Integrated Services Digital Network
LLU	Local Loop Unbundling
Local Exchange (or LE)	The telephony exchange closest to a given End User, usually also offering dedicated Co-location facilities, also termination point for point-to-point copper and fibre infrastructures
MEF	Metro Ethernet Forum
Migration	Process applicable when an End User is migrating for any type of electronic communication services, whereby the electronic telecommunication service initially provided by the Donor Operator will be cancelled and then activated for further provision by the Recipient Operator
NTP	Network Termination Point – termination point of the copper section of POST Technologies' network at the relevant End User's premises
NTU	Network Termination Unit – active equipment installed by POST Technologies at the End User's premises acting as demarcation device for the delivery of the service as defined in this ROB
OLT	Optical Line Termination
ONT	Optical Network Termination
Operator	Any legal or natural person operating telecommunications networks and/or providing telecommunications services in Luxembourg as approved by the ILR and having entered into a Broadband Agreement with POST Technologies
ORATH	Offre de Référence Accès Très Hauts Débits sur FTTH
Parties	Collectively POST Technologies and the Operator as specified in the relevant Broadband Agreement
Party	As the case may be, either POST Technologies or the Operator as specified in the relevant Broadband Agreement
Passive Equipment	All the passive equipment e.g. central splitters, in-house cabling, outlets, patchcords required between POST Technologies' NTP, FO-NTP, ONT an/or NTU for the purpose of provisioning Broadband Services at the End User's premises
POI	Point Of Interconnection (in this ROB the POI between POST Technologies' Network and the Operator's network being the RHD)
POP	Point Of Presence
POST Luxembourg	Name used in all its commercial relationships by the "Entreprise des Postes et Télécommunications, an autonomous "Etablissement Public" created by the "Loi du 10 août 1992 portant création de l'Entreprise des Postes et Télécommunications" as further modified.
POST Technologies	Telecommunications division of POST Luxembourg
POST Technologies' Network	Collection of all terminal nodes, links and intermediate which are connected so as to enable telecommunication between all terminals. Includes POST Technologies' passive network (copper and fibre network) as well as POST Technologies' active transport network (access, aggregation and backbone).
POST Technologies' Website	Refers to POST Technologies' website for operators http://www.posttechnologies.lu/en/operators
POTS	Plain Ordinary Telephone Service (analogue telephone service)
PSTN	Public Switched Telephone Network

QoS	Quality of Service
RCO	Reference Co-location Offer
RDSLO	Reference DSL Offer
Recipient Operator	The Operator receiving an End User's migrated Bitstream Service from a Donor Operator
Regulation 14/177/ILR	The ILR regulation referenced 14/177/ILR, dated August 28, 2014 and titled « <i>Règlement 14/177/ILR du 28 août 2014 concernant les procédures à suivre par un opérateur identifié comme puissant sur le marché dans le cadre de l'obligation de publication d'une offre de référence</i> », as may be subsequently amended or replaced in whole or in part.
Regulation ILR/T19/1	The ILR regulation referenced ILR/T19/1, dated March 13, 2019 and titled « <i>Règlement ILR/T19/1 du 13 mars 2019 portant sur les modalités relatives au contrôle de l'obligation de l'équivalence des intrants (EoI)</i> », as may be subsequently amended or replaced in whole or in part.
Regulation ILR/T19/4	The ILR regulation referenced ILR/T19/4, dated March 13, 2019 and titled « <i>Règlement ILR/T19/4 du 13 mars 2019 portant sur la définition du marché pertinent de la fourniture en gros d'accès central en position déterminée pour produits de grande consommation (Marché 3b/2014), l'identification de l'opérateur puissant sur ce marché et les obligations lui imposées à ce titre</i> », as may be subsequently amended or replaced in whole or in part.
RHD (<i>"Raccordement très Haut Débit"</i>)	Interconnection between POST Technologies' Network and the Operator's network in this ROB
ROB	The present Reference Offer for Broadband Services
ROB Tariff(s)	Any tariff applicable to any part of the Broadband Service(s) as specified in Schedule 6 and Annexes 1 and 2 attached to this ROB
RUO	Reference Unbundling Offer
Rush Order	Order which will be processed with high priority for expedited activation of the Broadband Service
Service Profile	Set of specifications which determine the Broadband Service
Technical Information	Documentation about the technical characteristics related to this ROB and made available to the Operators on POST Technologies' Website
VoE	Voice over Ethernet (VoE services as specified in this ROB are also often referred to as VoB – Voice over Broadband services)
VoIP	Voice over IP
VDSL	Very High speed Digital Subscriber Line
VDSL Bonding	Technology allowing the combined use of multiple VDSL lines for increased throughput
xDSL	Digital subscriber line technologies using the voice-graded copper access network to provide broadband services to customer premises. xDSL technologies supported by POST Technologies for Bitstream Services currently include ADSL1, ADSL2, ADSL2+, VDSL2, VDSL2 2-pair Bonding and G.fast technologies depending on the available infrastructure between POST Technologies' broadband access equipment and the End User's premises concerned.
Web Service Application	Application communicating over the internet and used for the ordering process of Bitstream Services

Schedule 2 Broadband Service Description

2.1. Generalities

The Services described in this ROB are compliant with the specifications of the MEF. Profiles and definitions are based on four parameters (CIR, CBS, EIR, and EBS) defined by the MEF.

CIR bandwidths described in this ROB apply to the Layer 2 Ethernet level including the Ethernet Frame Header according to IEEE 802.3. Therefore the usable bandwidth for the End User will be smaller than the bandwidth indicated in this ROB for each bandwidth profile.

The line rate of the physical Ethernet interface also includes additional overhead in the shape of Inter-Frame Gap, Preamble & Start of Frame Delimiter (SFD) which also limit the attainable Information Rate on a physical Ethernet interface (i.e. lower than 100 Mbps on a Fast Ethernet interface, lower than 1000 Mbps on a Gigabit Ethernet interface). As defined in the MEF specifications this overhead is not counted towards the Committed Information Rate of an Ethernet Virtual Connection.

The following table gives examples of the usable bandwidth depending on the frame length.

	Frame length (bytes)				
	64	128	256	1024	1522
Ethernet Line Rate (Mbps)	Usable throughput (Mbps)				
100	50	71,62	84,78	95,98	97,28
1000	500	716,22	847,83	959,77	972,76

Table 1: Usable throughput for upper layers depending on Ethernet frame length

The Broadband Services are composed of the following two (2) types of services:

- Bitstream Services
- EtherConnect Services

Each of these services will be specified in the following paragraphs.

2.2. Bitstream Services Description

Bitstream Services are Broadband Services designed for mass-market consumption using standardised implementation processes.

2.2.1. Bitstream Service Components and Service Profiles

The Bitstream Service allows the Operator to connect to POST Technologies' ADSL, VDSL, G.fast and GPON networks and offer value-added broadband services to its customers by implementing its own service access profiles adapted to the specific needs of its End Users. The Bitstream Service is provided as a stand-alone service and does not require the use of a new or existing phone line.

The Bitstream Service is composed of three different components:

- (i) Access
- (ii) Connectivity
- (iii) RHD interconnection

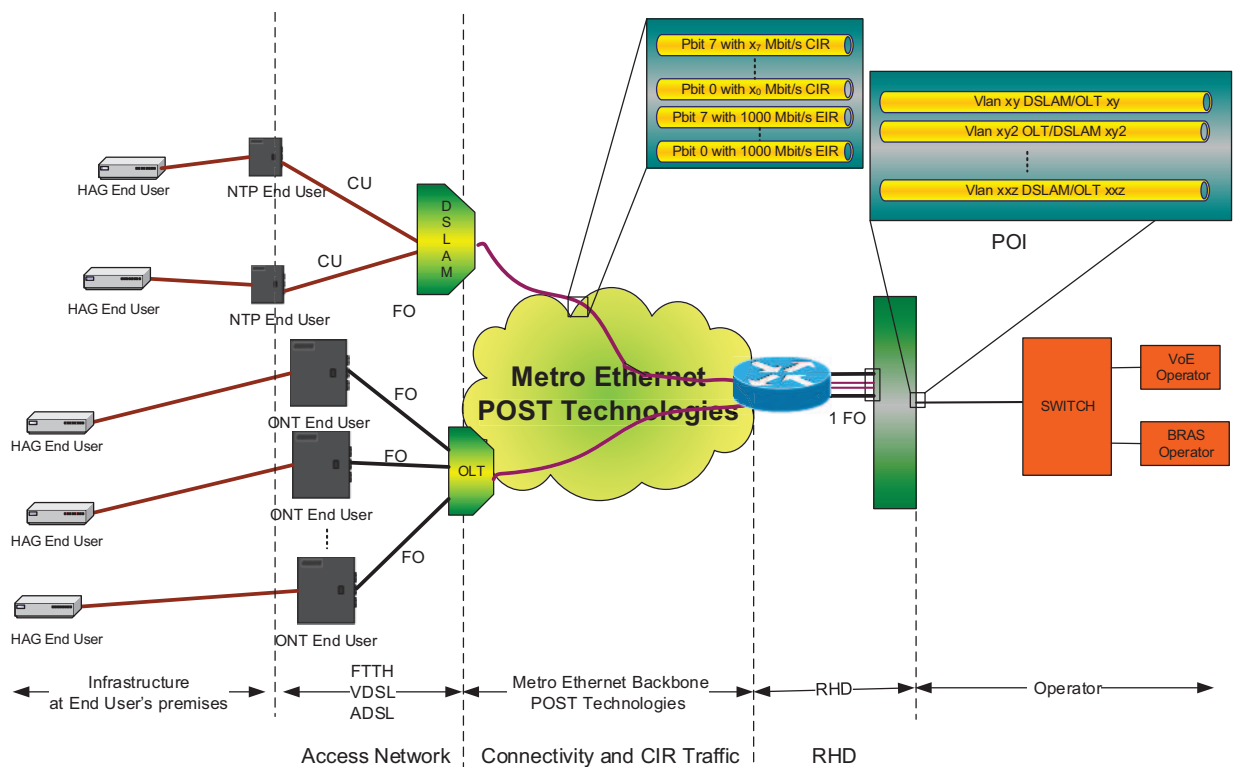


Figure 1: Bitstream Service components in a Mono-VC configuration

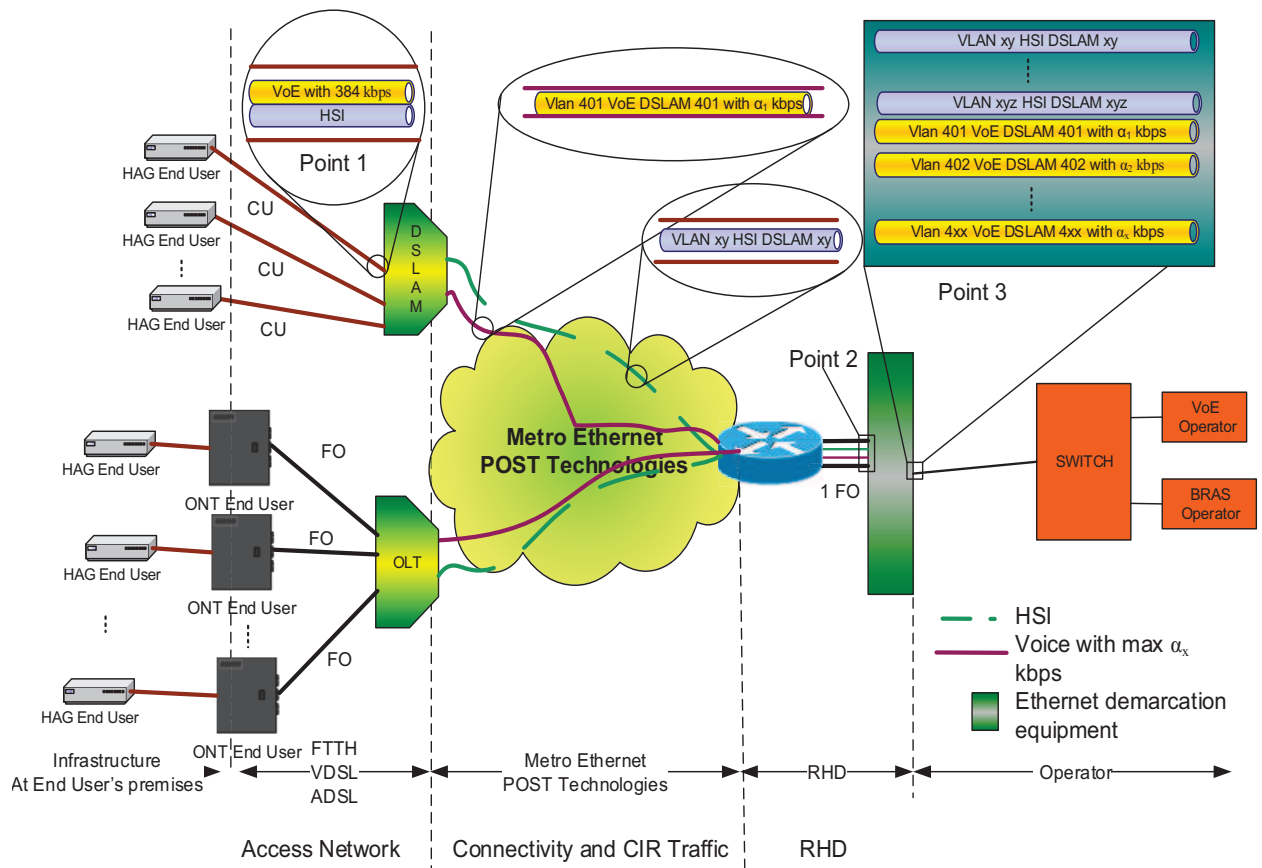


Figure 2: Bitstream Service components in a Multi-VC configuration

POST Technologies provides flexible "Open Access" profiles in a Mono-VC configuration (a single VLAN for all of the Operator's services, e.g. Internet, VoE, etc.) which allow the Operator to purchase and pay only for the traffic and bandwidth actually needed for its own commercial products. A range of pre-defined bandwidth profiles which come in both a Mono-VC and Multi-VC configuration (i.e. one VLAN per service) are available to choose from.

The following table provides an overview of the available Service Profiles.

Service Profile	Flex 20	Flex 100	Flex 300	Flex 500	Flex 1000
Downstream Maximum bandwidth	20 Mbps	100 Mbps	300 Mbps	500 Mbps	1 Gbps
Upstream Maximum bandwidth	10 Mbps	50 Mbps	150 Mbps	250 Mbps	500 Mbps
Eligible infrastructures	ADSL VDSL GPON G.fast	VDSL GPON G.fast	GPON G.fast	GPON G.fast	GPON

Service Profile	Fix 20	Fix 30	Fix 100	Fix 200
Downstream Maximum bandwidth	20 Mbps	30 Mbps	100 Mbps	200 Mbps
Upstream Maximum bandwidth	768 kbps	10 Mbps	50 Mbps	100 Mbps
Eligible infrastructures	ADSL VDSL GPON G.fast	VDSL GPON G.fast	VDSL GPON G.fast	GPON G.fast

Table 2: Bitstream Service Profiles

Availability of a specific Bitstream Service profile at a particular location depends on the underlying physical infrastructure. All Bitstream Service Profiles can be provided on a GPON Fibre infrastructure. In case such an infrastructure exists at a particular location and suitable in-house cabling exists which allows access to the Fibre-based Bitstream Service, no new Bitstream Services will be installed on a copper-based technology and all modifications of existing Bitstream Service Profiles running on xDSL technology will require its migration to a Fibre infrastructure.

GPON is the preferred technology for any installation. If Fibre is not available at a particular location, ADSL and VDSL technologies will be used to deliver the Bitstream Service. In this case eligibility and achievable bandwidth of a specific Bitstream Service Profile will depend upon the quality of the xDSL circuit (e.g. distance between NTP and DSLAM, attenuation, cross-talk).

The G.fast technology will only be used for in-house installations and act as a temporary substitute for a non-existent compatible in-house cabling in buildings which are already connected to POST Technologies' Fibre network. If a Fibre-based service cannot be implemented, because compatible in-house cabling cannot be deployed on short notice due to technical constraints or complexity, POST Technologies may install G.fast nodes inside the building and deliver all future Bitstream Services within that building via G.fast technology until a compatible in-house cabling has been installed. Operators, which face situations where requested Bitstream Services cannot be delivered as ordered because of the aforementioned in-house cabling complexity, can request the installation of a G.fast node by POST Technologies.

2.2.2. Access Component of the Bitstream Service

2.2.2.1. Definition of the Access Component

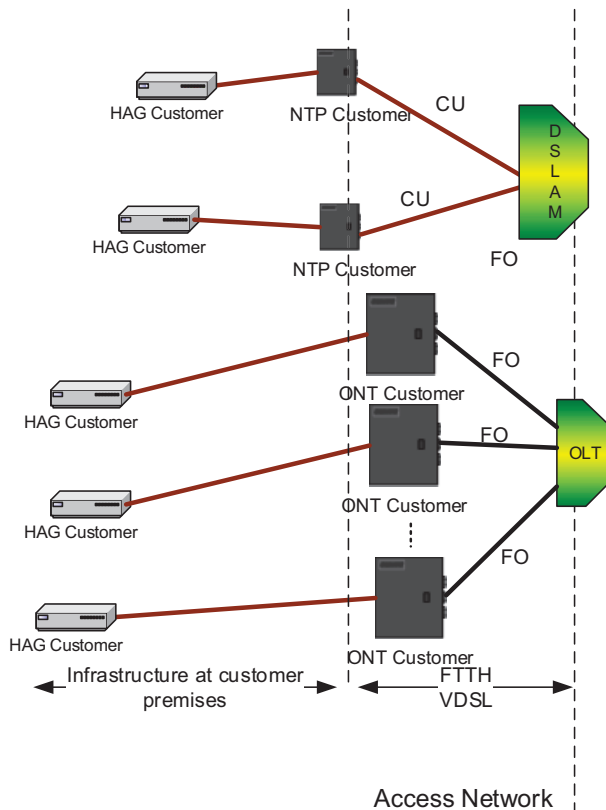


Figure 3: Access component of the Bitstream Service

For circuits based on an optical GPON infrastructure, the termination point at the End User's premises is the ONT installed by POST Technologies. The ONT offers a Gigabit Ethernet interface (RJ45) according to IEEE 802.3ab.

For circuits based on an ADSL, VDSL or G.fast infrastructure, the termination point at the End User's premises is the copper pair of the NTP installed by POST Technologies. This copper pair will be connected via POST Technologies' access network to a port on its DSLAM equipment.

As the maximum bandwidth of xDSL circuits depends on the distance between the DSLAM and the xDSL modem, the bandwidth of the Bitstream Services based on an xDSL infrastructure is limited to the maximum speed determined by the physical characteristics of the circuit. POST Technologies only deploys xDSL circuits if the physical characteristics of the circuit enable

- (i) a minimum data throughput of 5 Mbps in the downstream direction and 1 Mbps in the upstream direction for VDSL-based circuits;
- (ii) a minimum data throughput of 1 Mbps in the downstream direction and 128 kbps in the upstream direction for ADSL-based circuits.

The technical specifications of xDSL technologies used by POST Technologies in relation to the Bitstream Services are detailed on POST Technologies' Website.

The Bitstream Service is provided as a stand-alone product ("naked DSL") without a PSTN line on the same copper pair. However, the installation by the Operator of a centralised splitter in close proximity to the NTP is mandatory to minimise interferences from the internal network of the End User (Common Mode Rejection) and to avoid bridge tap effects (cable in parallel to the copper pair between the NTP and the xDSL modem) on the internal cabling of the End User. POST Technologies also recommends the use of Cat. 5e (or better) type cables between the splitter and the xDSL modem.

The HAG used by the Operator to deliver its services at the End User's premises on an xDSL infrastructure must be compatible with the ITU specifications as well as the specifications published on POST Technologies' Website. A list of HAGs approved by POST Technologies ("Whitelist") is also available on POST Technologies' Website. POST Technologies may also provide a 2-box-solution as described in paragraph 3.3.2.4 where POST Technologies delivers and installs at the End User's premises an xDSL modem with an Ethernet interface for the connection of the Operator's HAG.

On request, the Operator can test the compatibility between its HAG and POST Technologies' DSLAM equipment in POST Technologies' test laboratory. POST Technologies' point of contact to schedule an appointment is:

cpe.test.oao.technologies@post.lu

This service is invoiced at the hourly rate specified in Schedule 6 for each new type of equipment that the Operator intends to use at its End User's sites.

In case network alterations made by POST Technologies require a reevaluation of the Operator's already tested equipment, this service is provided free of charge if the duration of the tests does not exceed 4 hours. Additional hours will be invoiced at the rate specified in Schedule 6 - Tariffs.

2.2.2.2. Technical Parameters of the Access Component

Four different Bitstream Service options are available in a flexible "Open Access" configuration. Four options with pre-defined configurations are also available.

While there are no relevant bandwidth limitations on GPON infrastructures due to the physical characteristics of a fibre optic access line, the maximum bandwidth of the Bitstream Services based on xDSL infrastructures is limited to the maximum speed determined by the physical characteristics of the Access Line. Therefore the available bandwidth on xDSL access circuits between the NTP at the End User's site and the DSLAM might be lower than the maximum bandwidth associated with each Service Profile.

xDSL technologies supported by POST Technologies for Bitstream Services currently include ADSL1, ADSL2, ADSL2+, VDSL2, VDSL2 2-pair Bonding and G.fast technologies depending on the available infrastructure between POST Technologies' broadband access equipment and the End User's premises concerned.

The following table shows the minimum attainable bandwidth which shall be available for each Service Profile on xDSL infrastructures. If this minimum bandwidth cannot be provided due to physical limitations on the Access Line between the NTP and the DSLAM, the Service Profile will be deemed not eligible.

Service Profile	Flex 20	Flex 100	Fix 20	Fix 30	Fix 100
Downstream Minimum bandwidth	1 Mbps	5 Mbps	1 Mbps	5 Mbps	30 Mbps
Upstream Minimum bandwidth	128 kbps	1 Mbps	128 kbps	1 Mbps	2 Mbps

Table 3: Minimum achievable bandwidth for Bitstream Service Profiles to be deemed eligible on xDSL infrastructures

In case of violation of the Ethernet service parameters defined for each individual Bitstream Service, POST Technologies' Network will perform traffic policing according to the MEF specifications. The Operator has to manage its traffic flows in a way to ensure that the service parameters are not violated.

The following tables summarise the default EIR values for each of the Service Profiles. The parameter "maxDSL_d" designates the maximum attainable throughput in the downstream direction of the xDSL access line concerned, whereas "maxDSL_u" designates the maximum attainable throughput in the upstream direction of the xDSL access line concerned.

(i) Open Access Service Profiles

Bitstream Flex 20		
Technology	Downstream	
ADSL/VDSL	EIR	20 Mbps or maxDSL_d*)
G.fast	EIR	20 Mbps
GPON	EIR	20 Mbps
Technology	Upstream	
ADSL/VDSL	EIR	10 Mbps or maxDSL_u*)
G.fast	EIR	10 Mbps
GPON	EIR	10 Mbps

Table 4: Bitstream Flex 20 – available on ADSL, VDSL, G.fast and GPON infrastructures

*) EIR will be set to the lowest of the two values

Bitstream Flex 100		
Technology	Downstream	
VDSL	EIR	100 Mbps or maxDSL_d*)
G.fast	EIR	100 Mbps
GPON	EIR	100 Mbps
Technology	Upstream	
VDSL	EIR	50 Mbps or maxDSL_u*)
G.fast	EIR	50 Mbps
GPON	EIR	50 Mbps

Table 5: Bitstream Flex 100 – available on VDSL, G.fast and GPON infrastructures

*) EIR will be set to the lowest of the two values

Bitstream Flex 300		
Technology	Downstream	
G.fast	EIR	300 Mbps
GPON	EIR	300 Mbps
Technology	Upstream	
G.fast	EIR	150 Mbps
GPON	EIR	150 Mbps

Table 6: Bitstream Flex 300 – available on G.fast and GPON infrastructures

Bitstream Flex 500		
Technology	Downstream	
G.fast	EIR	500 Mbps
GPON	EIR	500 Mbps
Technology	Upstream	
G.fast	EIR	250 Mbps
GPON	EIR	250 Mbps

Table 7: Bitstream Flex 500 – available on G.fast and GPON infrastructures

Bitstream Flex 1000		
Technology	Downstream	
GPON	EIR	1000 Mbps
Technology	Upstream	
GPON	EIR	500 Mbps

Table 8: Bitstream Flex 1000 – only available on GPON infrastructures

(ii) Pre-defined Service Profiles

Bitstream Fix 20		
Technology	Downstream	
ADSL / VDSL	EIR	20 Mbps or maxDSL_d*)
G.fast	EIR	20 Mbps
GPON	EIR	20 Mbps
Technology	Upstream	
ADSL / VDSL	EIR	768 kbps or maxDSL_u*)
G.fast	EIR	768 kbps
GPON	EIR	768 kbps

Table 9: Bitstream Fix 20 – available on ADSL, VDSL, G.fast and GPON infrastructures

*) EIR will be set to the lowest of the two values

Bitstream Fix 30		
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Technology		Downstream	
VDSL	EIR	30 Mbps or maxDSL_d*)	
G.fast	EIR	30 Mbps	
GPON	EIR	30 Mbps	
Technology		Upstream	
VDSL	EIR	10 Mbps or maxDSL_u*)	
G.fast	EIR	10 Mbps	
GPON	EIR	10 Mbps	

Table 10: Bitstream Fix 30 – available on VDSL, G.fast and GPON infrastructures

*) EIR will be set to the lowest of the two values

Bitstream Fix 100			
Technology		Downstream	
VDSL	EIR	100 Mbps or maxDSL_d*)	
G.fast	EIR	100 Mbps	
GPON	EIR	100 Mbps	
Technology		Upstream	
VDSL	EIR	50 Mbps or maxDSL_u*)	
G.fast	EIR	50 Mbps	
GPON	EIR	50 Mbps	

Table 11: Bitstream Fix 100 – available on VDSL, G.fast and GPON infrastructures

*) EIR will be set to the lowest of the two values

Bitstream Fix 200			
Technology		Downstream	
G.fast	EIR	200 Mbps	
GPON	EIR	200 Mbps	
Technology		Upstream	
G.fast	EIR	100 Mbps	
GPON	EIR	100 Mbps	

Table 12: Bitstream Fix 200 – only available on G.fast and GPON infrastructures

For Bitstream Services with pre-defined bandwidth profiles a default guaranteed capacity of 306,4 kbps is configured on the DSLAM/OLT port for each individual Bitstream access circuit in a Mono-VC configuration for the exclusive use of VoE services. This capacity is split according to the values shown in the following table.

Traffic type	Priority Bit	Ethernet service parameters
VoE Data	7	CIR 268 kbps, EIR 0 kbps
Network Control (NC)	6	CIR 19,2 kbps, EIR 0 kbps

VoE Signalling	5	CIR 19,2 kbps, EIR 76,8 kbps
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Table 13: Voice service parameters for pre-defined Bitstream Service Profiles

In case of Multi-VC configurations dedicated VLANs are used for HSI (High Speed Internet) and VoE (Voice over Ethernet) services between the End User's CPE and the DSLAM/OLT. The VoE VLAN is configured with the following service parameters:

Traffic type	Priority Bit	VoE VLAN configuration
VoE Data	7	CIR 268 kbps, EIR 0 kbps
Network Control (NC)	6	CIR 19,2 kbps, EIR 0 kbps
VoE Signalling	5	CIR 19,2 kbps, EIR 76,8 kbps
Best Effort Traffic	0	CIR 0 kbps, EIR 384 kbps

Table 14: Default VoE VLAN configuration for pre-defined Bitstream Service Profiles in Multi-VC configurations

The Bitstream Service is transparent to all Layer 3 protocols. The maximum MTU size is 1548 bytes.

Layer 2 and Layer 3 QoS markings configured by the Operator will be transmitted between the End User and the DSLAM/OLT in a transparent way without any alterations.

A maximum of 15 MAC addresses for xDSL-based Bitstream Services and of 62 MAC addresses for G.fast- and GPON-based Bitstream Services are allowed by default in POST Technologies' Network.

2.2.3. Connectivity Component of the Bitstream Service

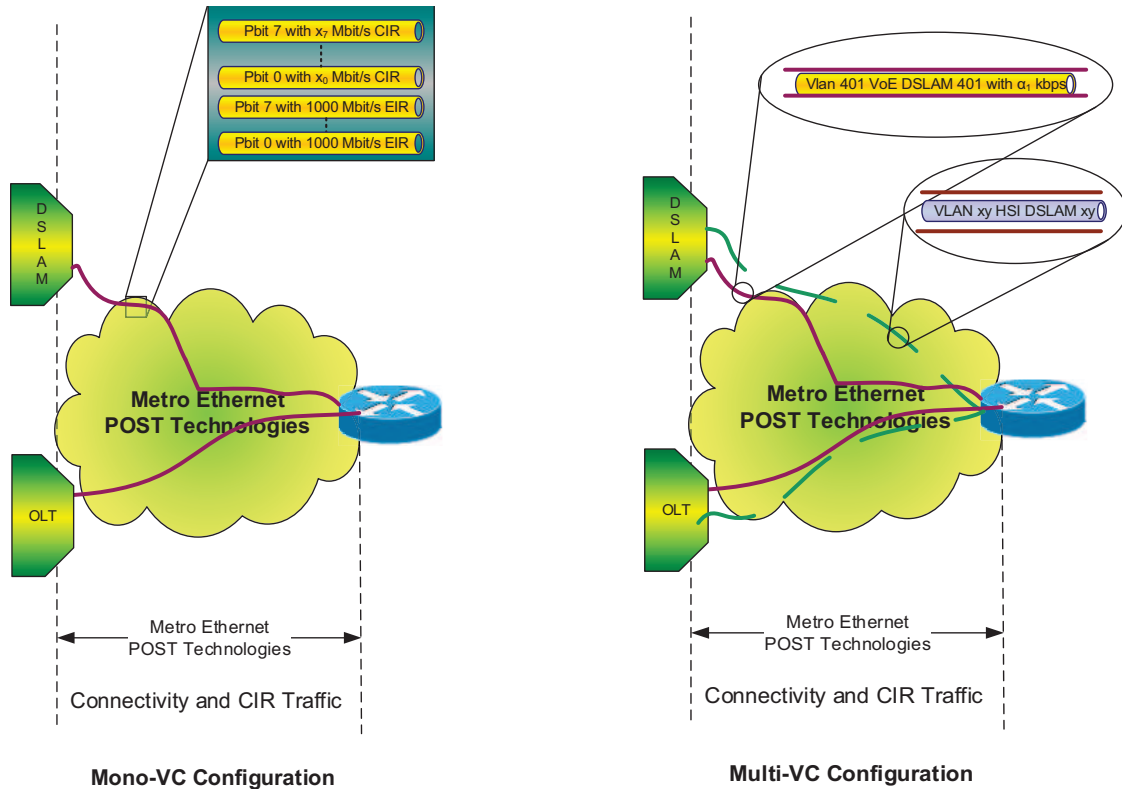


Figure 4: Connectivity component of the Bitstream Service

The Connectivity component ensures the transmission of the Bitstream Service through POST Technologies' Network from the DSLAM/OLT to the RHD ("Raccordement Haut Débit") interconnection between POST Technologies and the Operator.

Two configurations are available:

(i) Mono-VC

One (double tagged) ROOT_VLAN will be configured between each DSLAM/OLT and the RHD of the Operator. All services of the Operator (e.g. HSI/High Speed Internet, VoE/Voice over Ethernet) will be transmitted within the same VLAN. The double-tagged VLANs are defined by the combination of their S-Tag (which identifies the DSLAM/OLT) and the C-Tag (which identifies the Operator).

(ii) Multi-VC

Multiple (double tagged) VLANs will be configured between each DSLAM/OLT and the RHD of the Operator, enabling the Operator to have one dedicated VLAN for each of its services. By default the Bitstream Services are configured with one VLAN for HSI and one VLAN for VoE. The double-tagged VLANs are defined by the combination of their S-Tag (which identifies the DSLAM/OLT) and the C-Tag (which identifies each Operator's service).

2.2.3.1. Mono-VC Configuration

The ROOT_VLAN between each DSLAM/OLT and the RHD has an EIR capacity equal to the capacity of the DSLAM/OLT's connectivity to POST Technologies' backbone. EIR capacity will be shared between all connected operators (including POST Technologies).

(i) EIR "Best Effort" traffic

A basic usage is included in the monthly subscription fee of each Bitstream Service in order to cover the average peak hour usage generated by all End Users of an identical Service Profile. These values will be reviewed once per year. The following table gives you the average bandwidth usage included for each of the Bitstream Service Profiles.

	Service Profile							
Flex 20	Flex 100	Flex 300	Flex 500	Flex 1000	Fix 20	Fix 30	Fix 100	Fix 200
0,7 Mbps	2,0 Mbps	4,0 Mbps	6,0 Mbps	10 Mbps	0,7 Mbps	2,0 Mbps	4,0 Mbps	6,0 Mbps
Traffic included								

Table 15: Bandwidth consumption included with each Bitstream Service Profile

If the total usage of all of the Operator's Bitstream Services exceeds the sum of all the usage already included in the basic subscription fee of the Bitstream Services, the excess traffic measured at RHD level will be invoiced according to Schedule 6. Details of the measurement are given in paragraph 2.2.4.2.

(ii) CIR "guaranteed" traffic

The ROOT_VLAN is preconfigured with a CIR capacity of 2,4 Mbps and optimised in order to carry voice traffic, as defined in the following table.

Service Parameter	VoE Data	Network Control	VoE Signalling
Priority Bit (802.1p)	7	6	5
CIR	2,10 Mbps	0,15 Mbps	0,15 Mbps
Total voice-related bandwidth in ROOT_VLAN: 2,4 Mbps			

Table 16: Default configuration for CIR traffic in ROOT_VLAN

Up to 4000 ROOT_VLAN's can be configured on a single RHD of an Operator.

N.B.: The sum of the CIR capacities of all the Bitstream Services (as specified in paragraph 2.2.2.2) delivered via the same DSLAM/OLT can be greater than the CIR capacity of the ROOT_VLAN for this DSLAM/OLT.

The Operator may receive a tailor-made quote if the default configuration as specified in Table 16 does not match the Operator's needs.

The Bitstream Service is transparent to all Layer 3 protocols. The maximum MTU size is 1548 bytes.

Layer 2 and Layer 3 QoS markings configured by the Operator will be transmitted between the End User and the DSLAM/OLT in a transparent way without any alterations.

Traffic sent to or from a DSLAM/OLT marked with a priority bit, but exceeding the pre-configured CIR capacity for this DSLAM/OLT, will not be prioritised and therefore will be processed in the same way as EIR "Best Effort" traffic.

Priority markings for EIR traffic will not be taken into account in POST Technologies' Metro Ethernet network. Nevertheless, the Operator can use prioritisation of its EIR traffic at the End User's HAG and in its terminal equipment.

2.2.3.2. Multi-VC Configuration

Two ROOT_VLANs between each DSLAM/OLT and the RHD will be configured by default. The VLAN for HSI (High Speed Internet) services has an EIR capacity equal to the capacity of the DSLAM/OLT's connectivity to POST Technologies' backbone. EIR capacity will be shared between all connected operators (including POST Technologies). The second VLAN is optimised for VoE services.

- (i) EIR "Best Effort" traffic

A basic usage is included in the monthly subscription fee of each Bitstream Service in order to cover the average peak hour usage generated by all End Users of an identical Service Profile. These values will be reviewed once per year. The following table gives you the average bandwidth usage included for each of the Bitstream Service Profiles.

Service Profile	Fix 20	Fix 30	Fix 100	Fix 200
Bandwidth included	0,7 Mbps	2,0 Mbps	4,0 Mbps	6,0 Mbps

Table 17: Bandwidth consumption included with each Bitstream Service Profile

If the total usage of all of the Operator's Bitstream Services exceeds the sum of all the usage already included in the basic subscription fee of the Bitstream Services, the excess traffic measured at RHD level will be invoiced according to Schedule 6. Details of the measurement are given in paragraph 2.3.3.2.

- (ii) CIR "guaranteed" traffic

The second ROOT_VLAN between each DSLAM/OLT and the RHD is preconfigured with a CIR capacity of 3,0 Mbps, optimised in order to carry voice traffic, as defined in the following table.

Service Parameter	VoE Data	Network Control	VoE Signalling	Best Effort
Priority Bit (802.1p)	7	6	5	0
CIR	2,10 Mbps	0,15 Mbps	0,15 Mbps	n/a
EIR	0 Mbps	0 Mbps	0,03 Mbps	3 Mbps

Total bandwidth in default VoE ROOT_VLAN: 3,0 Mbps
--

Table 18: Default configuration for CIR traffic in default VoE ROOT_VLAN

Up to 4000 ROOT_VLAN's can be configured on a single RHD of an Operator.

N.B.: The sum of the CIR capacities of the VoE VLANs of all individual Bitstream Services (as specified in paragraph 2.2.2.2) delivered via the same DSLAM/OLT can be greater than the CIR capacity of the ROOT_VLAN for this DSLAM/OLT.

The Operator may receive a tailor-made quote if the default configuration as specified in Table 18 does not match the Operator's needs.

The Bitstream Service is transparent to all Layer 3 protocols. The maximum MTU size is 1548 bytes.

Layer 2 and Layer 3 QoS markings configured by the Operator will be transmitted between the End User and the DSLAM/OLT in a transparent way without any alterations.

Traffic sent to or from a DSLAM/OLT marked with a priority bit, but exceeding the pre-configured CIR capacity for this DSLAM/OLT, will not be prioritised and therefore will be processed in the same way as EIR "Best Effort" traffic.

Priority markings for EIR traffic will not be taken into account in POST Technologies' Metro Ethernet network. Nevertheless, the Operator can use prioritisation of its EIR traffic at the End User's HAG and in its terminal equipment.

2.2.3.3. CIR Traffic in a Bitstream Service

Depending on the CoS marking at layer 2 level, Ethernet packets will be assigned to a different forwarding class in order to ensure prioritised transmission across POST Technologies' Metro Ethernet backbone.

Ethernet packets must be marked by the Operator by setting the Priority code point (PCP) ("p-bit") as defined in IEEE 802.1Q to the values as specified in the following table. This table also shows the target maximum values for the corresponding service quality parameters and the maximum bandwidths per ROOT_VLAN available for ordering.

Priority Bit (p-bit)	Max. CIR*) (Mbps)	Delay**) (ms)	Jitter (ms)	Packet Loss (%)
7	5 %	20	10	0,10
6	10 %	30	-	0,20
5	10 %	40	-	0,20
4	20 %	50	-	0,10
3	50 %	50	-	0,40
2	50 %	50	-	0,50
1	50 %	80	-	0,30
0	n/a	80	-	-

Table 19: Specifications for CIR traffic

*) Maximum CIR bandwidth which can be ordered per ROOT_VLAN

**) One-way delay between NTU at End User site and RHD at POST Technologies' co-location facilities

2.2.4. RHD Component of the Bitstream Service

2.2.4.1. RHD Specifications

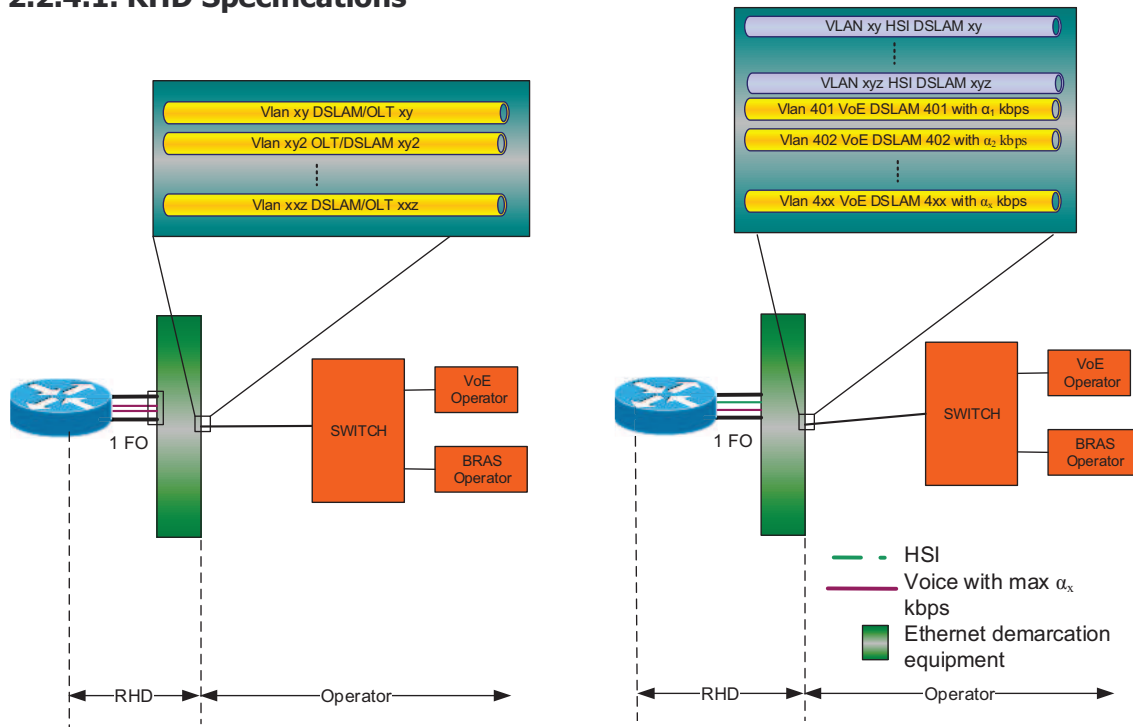


Figure 5: Connectivity component of the Bitstream Service in a Mono and Multi-VC configuration

The RHD ("Raccordement Haut Débit") interconnects POST Technologies' Network with the network of the Operator and consists in a dedicated Ethernet port which serves as an aggregation point for the Operator's Bitstream Services. There is neither a limitation to the number of individual Bitstream Services an Operator can aggregate on a single RHD nor to the bandwidth the Operator may be allowed to use on the RHD. The same RHD can be used for the aggregation of Mono-VC and Multi-VC Bitstream Services.

To connect its network to POST Technologies' "Metro Ethernet" backbone, each Operator must order an RHD interconnection which is terminated on POST Technologies side on an Ethernet demarcation equipment. The centralised RHD interconnections can be located either in one of POST Technologies' co-location facilities or in a POP of the Operator.

All Bitstream Services of every DSLAM/OLT equipment can be transported via POST Technologies' Metro Ethernet backbone to one or multiple centralised RHD aggregation ports.

POST Technologies' Local Exchanges available for centralised RHD interconnections are:

- i. CT Gare: 10, rue d'Epernay, L-1490 Luxembourg
- ii. CT Belair: 1, rue Yolande, L-2761 Luxembourg
- iii. CT Esch/Wobrecken: 69, rue Arthur Useldinger, L-4351 Esch-sur-Alzette

The Operator can also opt for a second centralised RHD interconnection in order to achieve redundancy (failover) or perform traffic load-balancing. The chosen configuration will be applied to all Bitstream circuits ordered by the Operator for the same RHD interconnection. The monthly recurring fees for back-up RHD ports are the same as for primary RHD ports.

Within the double tagged ROOT_VLAN, the S-TAG identifies the DSLAM/OLT equipment whereas the C-TAG identifies the Operator or the Operator's services.

Centralised RHD interconnections can be installed within POST Technologies' co-location facilities or at the Operator's own datacenters:

(i) On-Site RHD (RHD interconnections in co-location facilities)

The On-Site RHD interconnection terminates on POST Technologies side on an Ethernet demarcation equipment installed in one of POST Technologies' Local Exchanges or Area POPs and extends via a pair of singlemode fibres to the Operator's point of presence in the co-location facilities of the same Local Exchange or Area POP. The Operator can choose between one of the following interfaces:

- a. 10GBase-LR LAN PHY, 1310 nm
- b. 40Gbase-LR4, 1310 nm
- c. 100GBASE-LR4, 1310 nm

The Ethernet ports used for the RHD interconnection will be configured by default in link aggregation mode using the Link Aggregation Control Protocol (LACP) in order to facilitate adding another port of the same type at the same location in order to increase RHD bandwidth.

The lead time is sixty (60) Business Days after receipt of a firm order for the 10GBase-LR RHD links.

(ii) Off-Site RHD (Centralised RHD interconnections in an Operator's own POP)

The centralised Off-Site RHD interconnection is extended from one of the aforementioned POST Technologies Local Exchanges to the Operator's POP where it terminates on a dedicated Ethernet demarcation device. The Operator must provide POST Technologies free of charge with the necessary rack space and a 230V/AC power source for this demarcation equipment. The costs for the electric power consumption as well as any required internal optical cabling in this POP will have to be borne by the Operator.

A feasibility study for the RHD extension will be made subject to the prior signature of the ROB by the Operator. Pricing of the RHD extension might depend on the distance between the Operator's POP and an access point to POST Technologies' Network. A tailor-made quote also mentioning the lead time for the delivery of the extended RHD interconnection will be submitted to the Operator within five (5) Business Days after receiving such a request.

2.2.4.2. Volume-based Billing Principles

The subscription fee of each individual Bitstream Service includes an EIR traffic volume covering the average monthly per-user usage during peak hour. This volume is converted to a bandwidth-equivalent equal to the average bandwidth necessary to generate this traffic volume during peak hour.

All Bitstream Services are aggregated on one or multiple RHD ports. The bandwidth measured on these RHD interfaces is equal to the combined bandwidth used by all of the Operator's End User's which are connected to this RHD.

In case the bandwidth measured on the RHD interconnections exceeds the sum of all the bandwidths included with each individual Bitstream Service connected to this RHD, this additional bandwidth is invoiced to the Operator on a monthly basis according to the terms specified in Schedule 6.

EIR traffic will only be measured on the RHD interconnection during the peak traffic period and billed according to the 95th percentile rule, meaning that of all the measurements made over a specified period of time, the highest 5% of these values will be discarded and that bandwidth usage will be billed based on the next highest value.

POST Technologies measures the downstream flows during the peak traffic period (currently between 20:00 and 22:00, subject to change) in 5-minute intervals. Each measured value is kept for the 95th percentile usage calculation at the end of the month. The average bandwidth used during a 5-minute sampling interval is calculated as the number of bits transferred throughout the interval divided by the duration of the interval (i.e. 300 seconds).

In this way each day 24 measurement values are generated or 720 values over a 30-day period. The 36 (= 5%) highest values are discarded at the end of a 30-day month and the 37th highest value will serve as the basis for the calculation of the excess traffic which will be billed in addition to the basic monthly subscription fee of the RHD interconnections and all the individual Bitstream Services. In case this specific value is lower than the sum of all the bandwidths already included in the individual Bitstream Services, no additional charges will be applied.

The EIR traffic volumes included in the subscription fees will be reviewed at the end of each year and, if required, adapted and published in an amended ROB in the month of January. POST Technologies will use the traffic usage of its retail unit as a reference to perform this exercise.

2.2.5. Multicast Option for Audio and Video Distribution

2.2.5.1. Definition of the Multicast Option

To optimise traffic distribution and resource utilisation across the network in case of IPTV applications, POST Technologies offers optional support for Multicast traffic management to Operators delivering audiovisual services (e.g. TV and radio channels) to its End Users thereby reducing the required transmission capacity within POST Technologies' backbone. Each Operator requesting the Multicast Option will receive a quote taking into account the specific technical requirements of the Operator (e.g. new Service Profiles) as well as statistical data on the expected usage. Before submitting such a tailor-made quote, technical meetings between POST Technologies and the Operator have to be scheduled in order to define the detailed specifications of the service and exchange any required information.

Multicast communication protocols enable a source to efficiently send the same information addressed to a group of users in a single transmission instead of initiating one traffic flow for each of these users.

The basic Bitstream Service Profiles as described in paragraph 2.2.1 do not include support for Multicast traffic configurations within POST Technologies' Network. The Multicast Option can be ordered for all the available Bitstream Service Profiles, individually for each Bitstream Service.

The Multicast Option will be available for all Bitstream Services, in Mono-VC and Multi-VC configurations, provided that the available bandwidth capacity of the Access Line allows the transmission of multicast services. In case of xDSL based access circuits, availability and number of Multicast flows might be limited. Detailed information about the available capacity at a specific End User address can be found on POST Technologies' Website.

Multicast traffic flows are only available in the downstream direction. End Users will not be able to generate multicast flows and only receive multicast flows transmitted by the Operator from a dedicated RHD interconnection.

The Multicast Option only includes the transport of audio and video streams provided by the Operator across POST Technologies' Network, but does not include the provision or encoding of audio and video channels or other content.

The pictures below show the multicast implementation in POST Technologies' Network between the Operator and the End User.

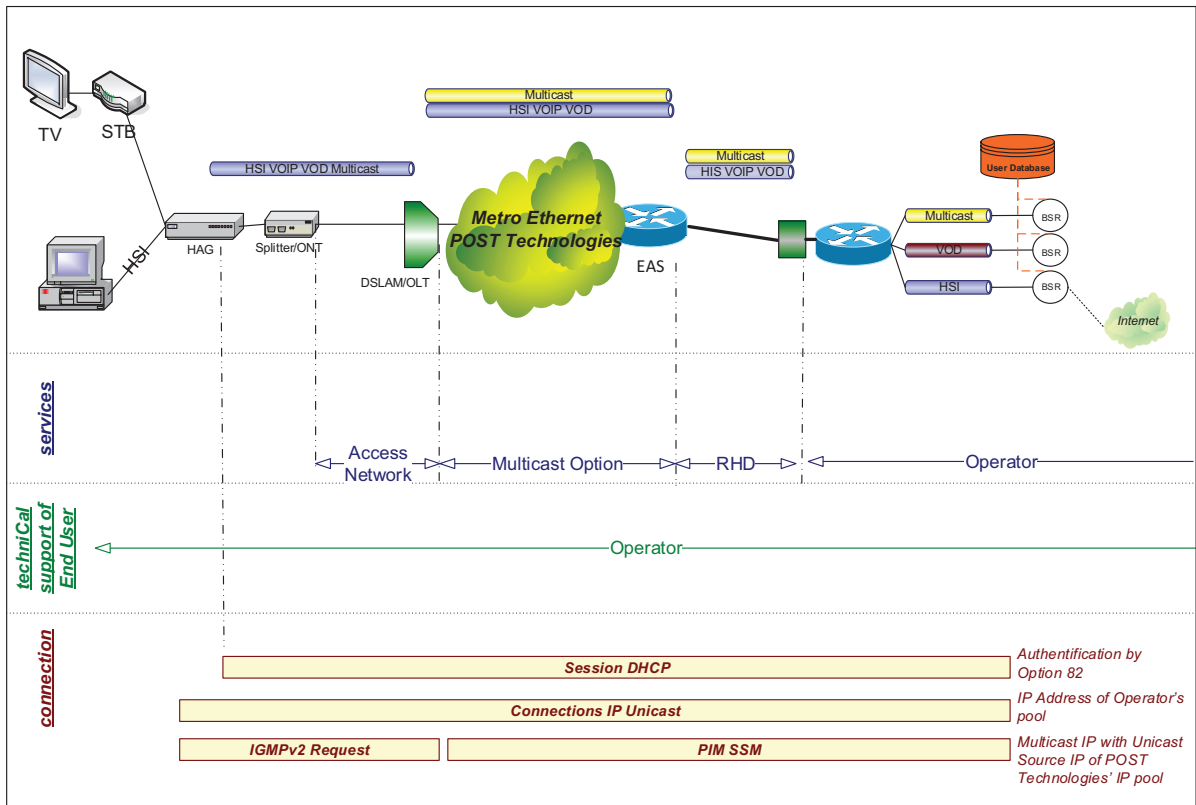


Figure 6: Multicast in Mono-VC configurations

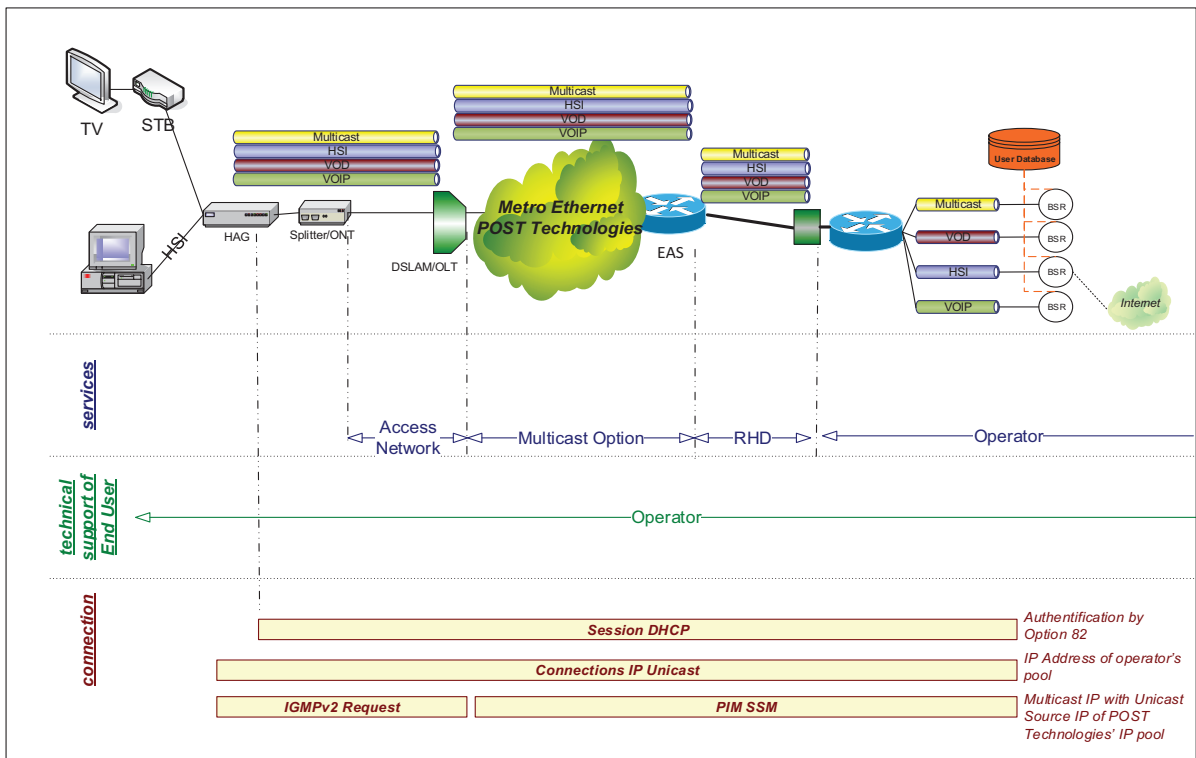


Figure 7: Multicast in Multi-VC configurations

POST Technologies' responsibilities are limited to the correct routing of the multicast flows from the RHD interconnection to the termination point at the End User's premises and do not extend beyond these demarcation points.

2.2.5.2. Technical Parameters of the Multicast Option

The following pictures show the traffic flows in a multicast configuration.

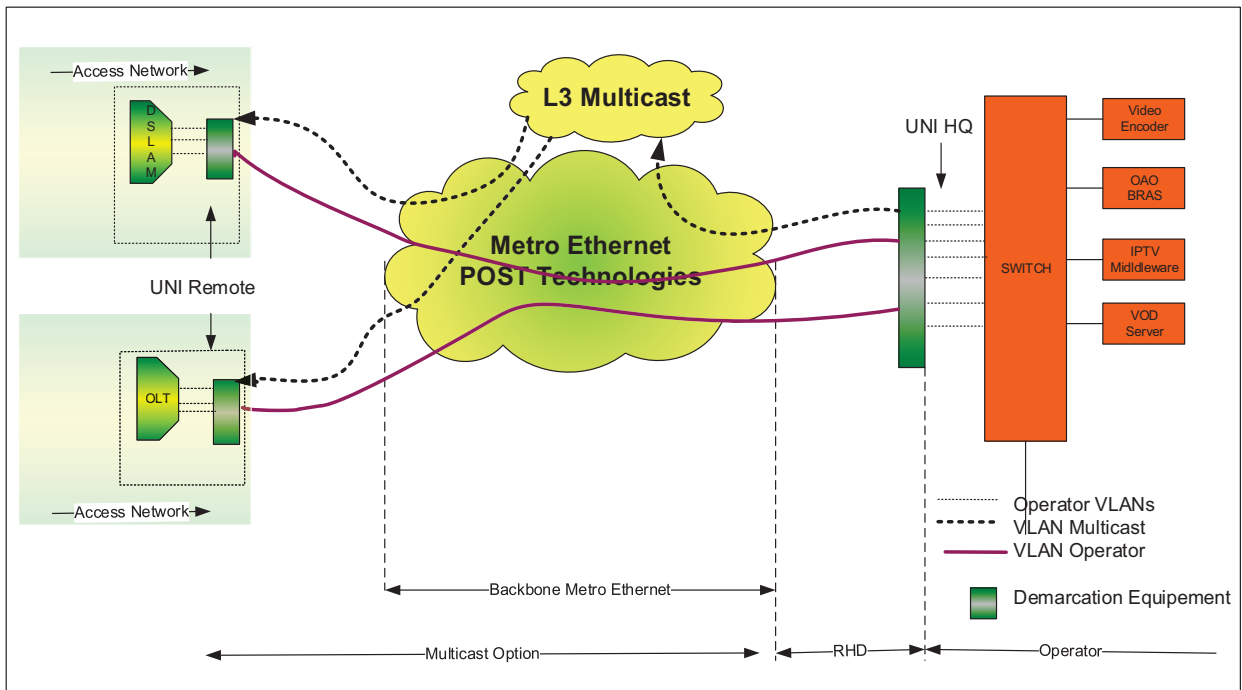


Figure 8: Multicast traffic flow in Mono-VC configurations

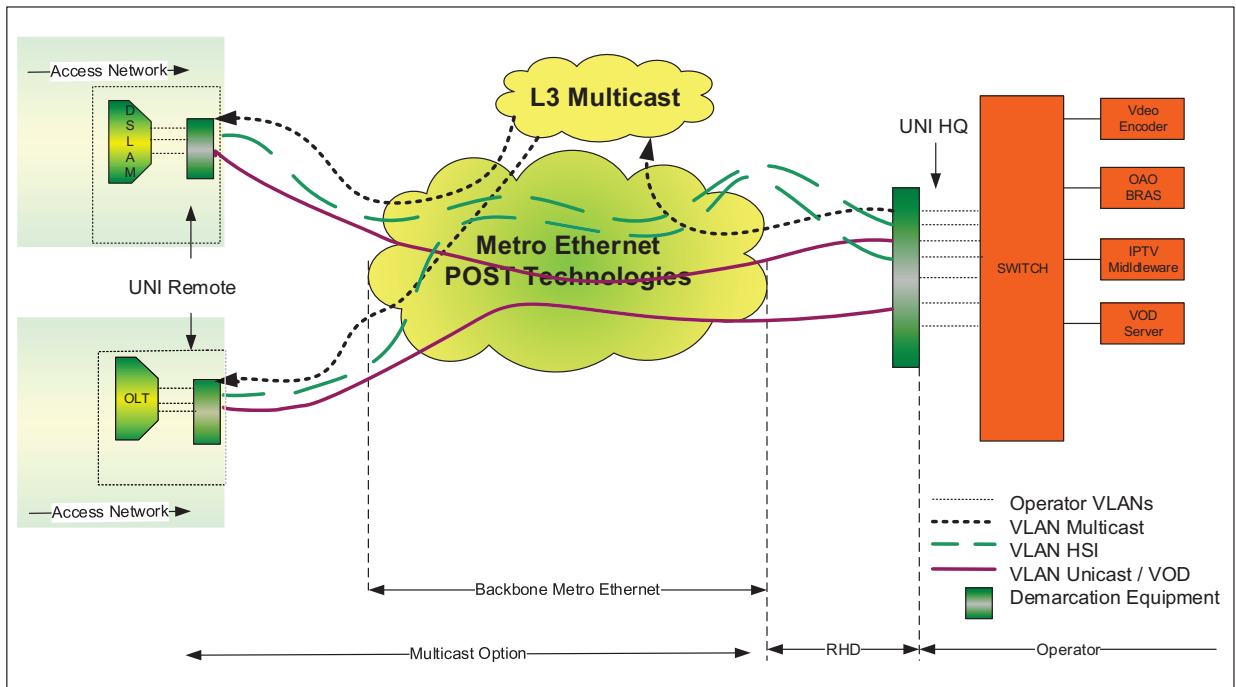


Figure 9: Multicast traffic flow in Multi-VC configurations

Multicast flows enable the transmission of audiovisual channels through POST Technologies' Metro Ethernet network to the End User using a "one-to-many" distribution technique. Using multicast there is no need for the duplication of the same flow on the same physical link. POST Technologies' Network replicates the flows as required for their delivery to the End User.

Transmission of a multicast flow is established only if a valid IGMP join request is issued by the End User's termination equipment. Static multicast and IGMPv1 are not supported. IGMPv2 hosts are supported.

Multicast flows are routed through POST Technologies' Network using the PIM-SSM protocol. An SSM-Translate table is implemented inside the core routers. A range of multicast group addresses with source IP addresses (<S,G>) will be provided to the Operator for multicast streams. The Operator must send the multicast stream at all times through the dedicated Multicast RHD ports (no support of PIM interaction between the Operator and POST Technologies).

The demarcation point between POST Technologies' backbone and the Operator's network is the RHD. End Users will only be able to access the Operator's channel encoders/distributors via the RHD interconnection. The Operator is responsible for dimensioning and ordering the RHD according to the bandwidth requirements of its services.

An IGMP query from an End User's device is only accepted by POST Technologies' network if this End User's Bitstream Service is enabled for multicast traffic. Therefore the Multicast option has to be ordered in addition to the basic Bitstream Service, either at the time of the initial order or at a later stage on top of an existing Bitstream Service.

In order to ensure the necessary transmission quality for audiovisual content, the Operator uses the priority bits as defined by IEEE 802.1p for the QoS marking of related Ethernet packets and to optimise the transmission of IPTV services across POST Technologies' Network.

Multicast Access Profiles will be defined which determine the number of multicast streams that an End User will be able to receive simultaneously. The maximum number of streams depends on the bandwidth required for each type of stream and the overall bandwidth available on the Access Line between the End User and the DSLAM/OLT.

The Operator will have access to an online database in order to check the available bandwidth for multicast services on an End User's access line while leaving a minimum bandwidth of 1 Mbps for the simultaneous use of HSI traffic. Besides bandwidth limitations, a maximum of 10 simultaneous streams will be supported on an End User's VDSL-based Bitstream Service, while a maximum of 62 simultaneous streams will be supported on an End User's G.fast- and GPON-based Bitstream Service.

The bandwidth requirements of the multicast streams are based on Layer 3 IP bandwidths including packet overhead. The actual net rate (payload) available for the MPEG2 transport stream is the result of removing the IP, UDP and RTP headers.

On request, POST Technologies provides a tailor-made quote if the Operator's requirements in terms of bandwidth per stream and QoS marking differ from the standards set for POST Technologies' own IPTV services.

2.2.5.3. Multicast Billing Principles

The Multicast Option will be billed according to the number of channels (different multicast flows injected via a dedicated RHD interconnection) made available to the Operator's End Users and the total amount of Multicast streams (SD/HD) ordered by the Operator's End Users and implemented in POST Technologies' access network.

Price calculation for the Multicast Option is based on the actual use of POST Technologies' Network, taking into account the benefits of the transmission of multicast streams. Thus, the price

per multicast stream per End User decreases if the number of identical streams to be transported throughout POST Technologies' Network increases.

Overall, the capacity used in POST Technologies' backbone depends on the mutualisation effect generated by the multicast transmission in the network. Thus, the price per stream also depends on the total number of audio/video channels available for distribution in the network, a small number of channels requiring less bandwidth than a much larger number of available channels.

The required bandwidth per stream has a direct influence on the price per stream per month. As some channels use more bandwidth than others (e.g. HD channels), the bandwidth taken into account for price determination will be based on the average bandwidth of all the available streams. Certain channels, depending on their type and their popularity, are more likely to be watched than others which also impacts the mutualisation effect in POST Technologies' backbone and the capacity required in its network.

In view of the above, it follows that the pricing of the Multicast Option is an extremely complex matter and requires various technical and statistical data in order to determine a well-founded price scheme for the transmission of multicast streams. Similarly, the initial implementation of the Multicast service, the activation of each channel (flow) and the definition, configuration and testing of new Multicast Access Profiles depend on multiple parameters. Therefore POST Technologies will submit a tailor-made quote to each Operator requesting this Multicast Option based on the aforementioned principles (in order to determine the bandwidth needed) and the tariffs for the CIR traffic component as set out in Schedule 6.

2.3. EtherConnect Service Description

Whereas Bitstream Services are designed for mass-market consumption, EtherConnect Services offer additional features in terms of resilience and service level guarantees in order to address the requirements of the more demanding corporate customers.

2.3.1. EtherConnect Service Components and Service Profiles

The EtherConnect Service allows the Operator to connect to POST Technologies' xDSL and fibre networks and offer value-added broadband services to its customers. EtherConnect Services are provided as stand-alone services and do not require the use of a new or existing phone line.

The EtherConnect Service is composed of the following two components:

- (i) Connectivity
- (ii) RHD interconnection

Various bandwidth profiles are available for EtherConnect Services as specified in the table below. As they are specifically designed to meet the requirements of the corporate End User, only symmetric Service Profiles are available for EtherConnect Services.

Service Profile	EC 2	EC 5	EC 10	EC 30	EC 50	EC 100
Downstream/Upstream (in Mbps)	2	5	10	30	50	100
Eligible infrastructures	xDSL FTTH FTTO	xDSL FTTH FTTO	xDSL FTTH FTTO	xDSL FTTH FTTO	xDSL FTTH FTTO	xDSL FTTH FTTO

Service Profile	EC 200	EC 500	EC 1000	EC 2000	EC 5000	EC 10000
Downstream/Upstream (in Mbps)	200	500	1000	2000	5000	10000
Eligible infrastructures	FTTH FTTO	FTTH FTTO	FTTH FTTO	FTTH FTTO	FTTH FTTO	FTTH FTTO

Table 20: EtherConnect Service Profiles

While Bitstream Services are limited in their use of infrastructures (ADSL, VDSL, VDSL 2-pair bonding, GPON) in order to allow product standardisation and a low-price approach for mass-market consumption, EtherConnect Services will not be restricted to the use of these technologies and infrastructures, but use a wider range of technologies in order to meet the End User's requirements in terms of bandwidth and resiliency. EtherConnect Services will also be provided on FTTO fibre infrastructures as well as use more than 2 copper pairs for a single EtherConnect Service in order to maximise eligibility of high-bandwidth services (e.g. use xDSL bonding techniques with more than 2 pairs).

Installations which require the use of more than 2 copper pairs or the deployment of alternative xDSL technologies (e.g. G.SHDSL, reach extenders) need to be implemented using non-standard equipment and testing procedures.

A specific Service Profile for an EtherConnect Service will only be eligible, if the bandwidth as specified in the table above can be guaranteed on the physical Access Line (downstream and upstream).

In case an activated fibre infrastructure exists at the End User's site, copper infrastructures will not be eligible for new EtherConnect Services even if a copper infrastructure is still active at this site or in use for existing services. In that case, installation of new EtherConnect Services or modifications of existing EtherConnect Services will only be carried out on copper infrastructures in cases where in-house cabling cannot be installed due to an increased level of technical complexity.

The EtherConnect Backup Service delivers a secondary EtherConnect Service to the same End User enabling the Operator to add resilience to the services provided to an End User. EtherConnect Backup Services always need to be associated to a primary "standard" EtherConnect Service and are not allowed to use the same RHD interconnection. Wherever possible, the EtherConnect Backup Service will use a different routing (i.e. distinct cable infrastructure connected to a distinct Local Exchange or Area POP) and be delivered on a separate NTU (Network Termination Unit). A feasibility study will be carried out for each detailed request for such services.

Service Profile	EC Backup (2 – 100 Mbps)	EC Backup (200 – 10000 Mbps)
Downstream/Upstream (in Mbps)	Same bandwidth as primary EtherConnect Service *)	Same bandwidth as primary EtherConnect Service
Eligible infrastructures	xDSL FTTH FTTO	FTTH FTTO

Table 21: EtherConnect Backup Service Profiles

*) In case only xDSL infrastructures are available at the backup site limiting the maximum available bandwidth to a value lower than the one of the primary EtherConnect Service, then the EtherConnect Backup Service can be ordered with a Service Profile different from the primary EtherConnect Service.

Failover Option

In addition to the EtherConnect Backup Service, which is a dedicated second physical circuit between the End User and an Operator's second RHD with failover mechanisms to be implemented and managed by the Operator itself, POST Technologies also offers another redundancy option which can be purchased for any EtherConnect service. In case of a failure at RHD level, this Failover Option managed by POST Technologies re-routes the traffic of all EtherConnect Services purchased with this Failover Option to a second RHD of the Operator.

2.3.2. Connectivity Component of the EtherConnect Service

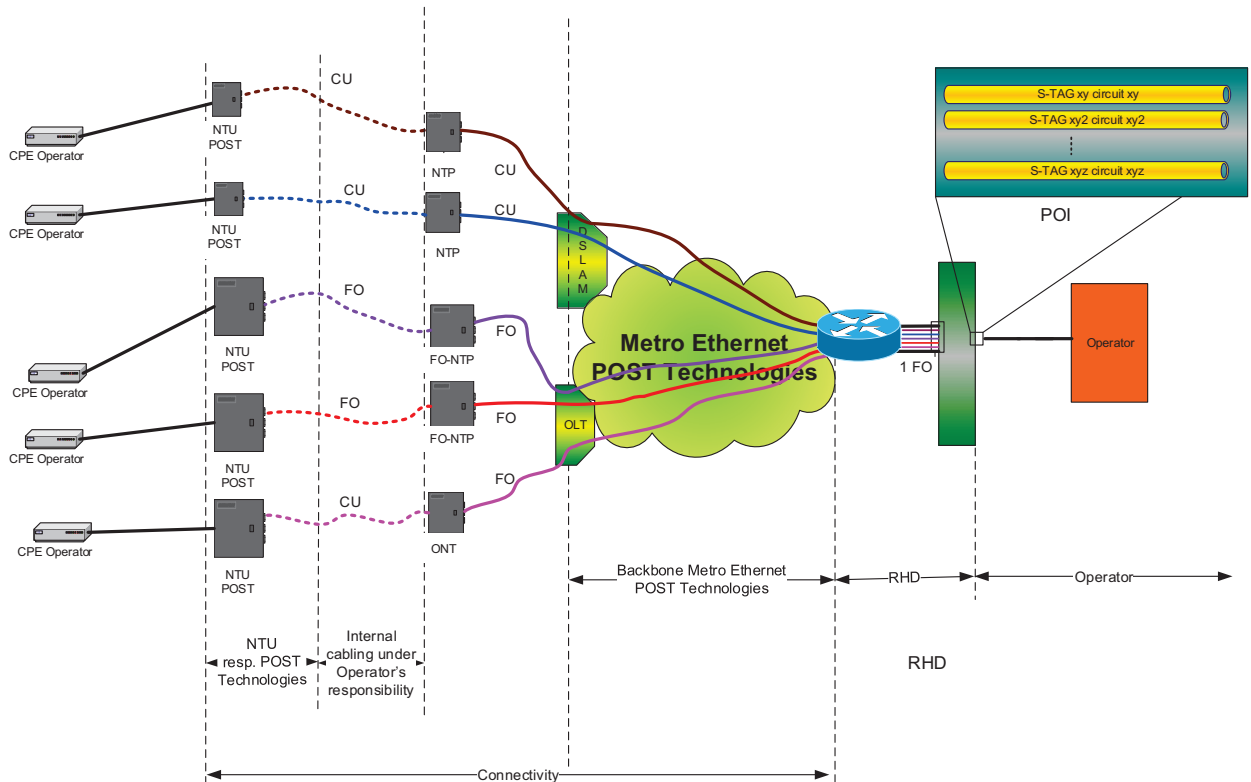


Figure 10: Connectivity component of the EtherConnect Service

An EtherConnect Service terminates towards the End User on a Fast Ethernet (RJ45), a Gigabit Ethernet (RJ45 or optical) or a 10 Gigabit Ethernet (optical) port of a NTU installed at the End User's premises in close proximity to the NTP, ONT or FO-NTP (i.e. without any additional in-house cabling infrastructure other than patchcords) and towards the Operator in a VLAN dedicated to this EtherConnect Service and identified by its VLAN tag (S-tag) on the RHD interconnection.

All traffic sent by or towards the Operator's End User is encapsulated in a VLAN dedicated to each EtherConnect Service. Using the C-Tag the Operator will be able to offer multiple services, each assigned to a different VLAN, over a single EtherConnect Service to its End User.

The EtherConnect Service is primarily aimed at providing Internet services, therefore data is sent over POST Technologies' Metro Ethernet backbone in its "Best Effort" service class. In order to allow the Operator to deploy additional features and monitor its services more efficiently, the EtherConnect Service Profiles also include guaranteed bandwidth reservation for network control protocols.

The table below shows the configuration of these VLANs depending on the chosen EtherConnect Service Profile.

Service Profile ^{*)}	p-bit 0		p-bit 6	
	CIR (Mbps)	EIR (Mbps)	CIR (Mbps)	EIR (Mbps)
EtherConnect 2	0	2	0,128	2
EtherConnect 5	0	5	0,256	5
EtherConnect 10	0	10	0,512	10
EtherConnect 30	0	30	1	30
EtherConnect 50	0	50	1	50
EtherConnect 100	0	100	1	100
EtherConnect 200	0	200	1	200
EtherConnect 500	0	500	1	500
EtherConnect 1000	0	1000	1	1000
EtherConnect 2000	0	2000	1	2000
EtherConnect 5000	0	5000	1	5000
EtherConnect 10000	0	10000	1	10000

Table 22: EtherConnect Service parameters

*) EtherConnect Service Profiles only available with symmetric bandwidths, therefore Service Profile parameters are identical for downstream and upstream.

Up to 4000 EtherConnect Services can be configured on a single RHD of an Operator.

The Operator may order additional CIR capacity and receive a tailor-made quote for its own EtherConnect Service Profiles as specified in paragraph 2.3.2.1.

The EtherConnect Service is transparent to all Layer 3 protocols. The maximum MTU size is 1548 bytes.

Layer 2 and Layer 3 QoS markings configured by the Operator will be transmitted between the NTU at the End User's premises and the RHD interconnection in a transparent way without any alterations.

Traffic marked with a priority bit, but exceeding the pre-configured CIR capacity for this EtherConnect Service, will not be prioritised and therefore will be processed in the same way as EIR "Best Effort" traffic.

Priority markings for EIR traffic will not be taken into account in POST Technologies' Metro Ethernet network. Nevertheless, the Operator can use prioritisation of its EIR traffic in its terminal equipment.

Multicast labeled packets can be sent over EtherConnect Services in the downstream direction, but will be blocked in the upstream direction.

A basic usage is included in the monthly subscription fee of each EtherConnect Service. The following table gives you the average bandwidth usage included for each of the EtherConnect Service Profiles.

Service Profile	EC 2	EC 5	EC 10	EC 30	EC 50	EC 100
Traffic included (Mbps)	2	5	10	15	25	50

Service Profile	EC 200	EC 500	EC 1000	EC 2000	EC 5000	EC 10000
Traffic included (Mbps)	100	200	400	800	1500	3000

Table 23: Bandwidth consumption included with the EtherConnect Service Profiles

If the total usage of all of the Operator's EtherConnect Services exceeds the sum of all the usage already included in the basic subscription fee of the EtherConnect Services, the excess traffic measured at RHD level will be invoiced according to Schedule 6. Details of measurement are given in paragraph 2.3.3.2.

No bandwidth usage is included for EtherConnect Backup Services as their use is restricted to provide backup connectivity in case the primary EtherConnect Service fails. If the Operator wants to operate two redundant EtherConnect Services for the same End User in an active/active mode, then the Operator should request a second "standard" EtherConnect Service connected to a different RHD.

2.3.2.1. CIR Traffic in an EtherConnect Service

Depending on the CoS marking at layer 2 level, Ethernet packets will be assigned to a different forwarding class in order to ensure prioritised transmission across POST Technologies' Metro Ethernet backbone.

Ethernet packets must be marked by the Operator by setting the Priority code point (PCP) ("p-bit") as defined in IEEE 802.1Q to the values as specified in the following table. This table also shows the target maximum values for the corresponding service quality parameters and the maximum bandwidths which can be included in the definition of a new EtherConnect Service Profile.

Priority Bit (p-bit)	Max. CIR^{*)}	Delay^{**)} (ms)	Jitter (ms)	Packet Loss (%)
7	5 %	20	10	0,10
6	10 %	30	-	0,20
5	10 %	40	-	0,20
4	20 %	50	-	0,10
3	50 %	50	-	0,40
2	50 %	50	-	0,50
1	50 %	80	-	0,30
0	n/a	80	-	-

Table 24: Specifications for CIR traffic

^{*)} Maximum CIR bandwidth which can be included in the definition of a new EtherConnect Service Profile indicated as the percentage of the total EtherConnect bandwidth (e.g. maximum CIR for "p-bit 6" traffic in an EC 50 service = 10 % of 50 Mbps = 5 Mbps)

^{**)} One-way delay between NTU at End User site and RHD at POST Technologies' co-location facilities

2.3.3. RHD Component of the EtherConnect Service

2.3.3.1. RHD Specifications

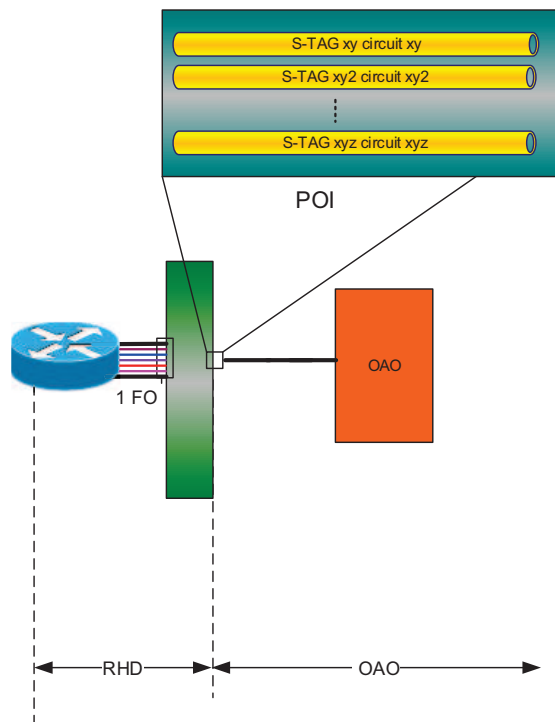


Figure 11: RHD component of the EtherConnect Service

The RHD ("Raccordement Haut Débit") interconnects POST Technologies' Network with the network of the Operator and consists in a dedicated Ethernet port which serves as an aggregation point for the Operator's EtherConnect Services.

RHD interconnections for Bitstream Services cannot be used for EtherConnect Services.

To connect its network to POST Technologies' "Metro Ethernet" backbone, the Operator must order an RHD interconnection which is terminated on POST Technologies side on an Ethernet demarcation equipment. The centralised RHD can be located either in one of POST Technologies' co-location facilities or in a POP of the Operator. All EtherConnect Services will be transported via POST Technologies' Metro Ethernet backbone to this centralised RHD aggregation port.

POST Technologies' Local Exchanges available for RHD interconnections are:

- (i) CT Gare: 10 rue d'Eprenay, L-1490 Luxembourg
- (ii) CT Belair: 1, rue Yolande, L-2761 Luxembourg
- (iii) CT Esch/Wobrecken: 69, rue Arthur Useldinger, L-4351 Esch-sur-Alzette

The Operator can also opt for a second RHD interconnection in order to achieve redundancy or perform traffic load-balancing. The Operator has to specify with each order for a new EtherConnect Service the RHD to which the EtherConnect Service connects.

VLANs on the RHD use the S-Tag for the identification of the EtherConnect Service, while the C-Tag can be freely administered by the Operator to identify its own services.

Centralized RHD interconnections can be installed within POST Technologies' co-location facilities or at the Operator's own datacenters:

(i) On-Site RHD (RHD interconnections in co-location facilities)

The On-Site RHD interconnection terminates on POST Technologies side on an Ethernet demarcation equipment installed in one of the aforementioned POST Technologies' Local Exchanges and extends via a pair of singlemode fibres to the Operator's point of presence in the co-location facilities of the same Local Exchange or Area POP. The Operator can choose between one of the following interfaces:

- a. 10GBase-LR LAN PHY, 1310 nm
- b. 40Gbase-LR4, 1310 nm
- c. 100GBASE-LR4, 1310 nm

The Ethernet ports used for the RHD interconnection will be configured by default in link aggregation mode using the Link Aggregation Control Protocol (LACP) in order to facilitate adding another port of the same type to increase RHD bandwidth.

The lead time is sixty (60) Business Days after receipt of a firm order for the RHD links.

(ii) Off-Site RHD (RHD interconnections in an Operator's own POP)

The Off-Site RHD interconnection is extended from one of the aforementioned POST Technologies Local Exchanges to the Operator's POP where it terminates on a dedicated Ethernet demarcation device. The Operator must provide POST Technologies free of charge with the necessary rack space and a 230V/AC power source for this demarcation equipment. The costs for the electric power consumption as well as any required internal optical cabling in this POP will have to be borne by the Operator.

A feasibility study for the RHD extension will be made subject to the prior signature of the ROB by the Operator. Pricing of the RHD extension might depend on the distance between the Operator's POP and an access point to POST Technologies' Network. A tailor-made quote also mentioning the lead time for the delivery of the extended RHD interconnection will be submitted to the Operator within five (5) days after receiving such a request.

2.3.3.2. Volume-based Billing Principles

The subscription fee of each individual EtherConnect Service includes an EIR traffic volume which is converted to a bandwidth-equivalent equal to the average bandwidth necessary to generate this traffic volume.

All EtherConnect Services are aggregated on one or multiple RHD ports. The bandwidth measured on this RHD interfaces is equal to the combined bandwidth used by all of the Operator's End User's which are connected to this RHD.

In case the bandwidth measured on the RHD interface exceeds the sum of all the bandwidths included with each individual EtherConnect Service connected to this RHD, this additional bandwidth is invoiced to the Operator on a monthly basis according to the terms specified in Schedule 6.

As EtherConnect Services are mainly targeted at corporate End User's, EIR traffic measurement on the RHD interconnection will not be limited to the peak traffic period determined by the residential customer's usage, but measured daily over the entire 24-hour period and billed according to the 95th percentile rule, meaning that of all the measurements made over a specified period of time, the highest 5% of these values will be discarded and that bandwidth usage will be billed based on the next highest value.

POST Technologies measures the downstream flows in 5-minute intervals. Each measured value is kept for the 95th percentile usage calculation at the end of the month. The average bandwidth used during a 5-minute sampling interval is calculated as the number of bits transferred throughout the interval divided by the duration of the interval (i.e. 300 seconds).

In this way each day 288 measurement values are generated or 8640 values over a 30-day period. The 432 (= 5%) highest values are discarded at the end of a 30-day month and the 433rd highest value will serve as the basis for the calculation of the excess traffic which will be billed in addition to the basic monthly subscription fee of the RHD interconnections and all the individual EtherConnect Services. In case this specific value is lower than the sum of all the bandwidths already included in the individual EtherConnect Services, no additional charges will be applied.

The EIR traffic volumes included in the subscription fees will be reviewed at the end of each year and, if required, adapted and published in an amended ROB in the month of January. POST Technologies will use the traffic usage of its retail unit as a reference to perform this exercise.

2.4. Service Termination

In case of a network migration that causes POST Technologies to abandon existing infrastructures, close or modify existing sites (e.g. Local Exchanges, street cabinets, NTPs) and to terminate the delivery of existing Broadband Services or services contracted via the previously available RDSLO and ORATH offers delivered via these sites and specific infrastructures, POST Technologies will notify the concerned Operators one (1) year in advance in case of a site where no Operator is present and five (5) years in advance in case of sites where an Operator is present. The list of the concerned sites and/or the individual affected circuits or NTPs is published on POST Technologies' Website and is updated regularly. It is the responsibility of the Operator to regularly consult POST Technologies' Website in this respect. At the end of the aforementioned period, no new Broadband Services will be delivered using the obsolete infrastructure of these sites and all remaining Broadband services or previously available RDSLO and ORATH services, which have not been migrated to a different infrastructure by that time, can be terminated.

Schedule 3 Planning, Ordering and Provisioning

3.1. Forecasting

Providing new Broadband Services to Operators as specified in this ROB is a very labour intensive activity. The volume of activity depends mainly on the commercial activity of the different Operators without any direct influence from POST Technologies. To allow proper planning of POST Technologies' production capacity and of its workforce allocation as well as to respond to the demand within the indicated time limits and to avoid bottlenecks, an accurate forecasting of the required provisioning, based on historical data from POST Technologies' systems and in some cases from Operators concerned, is essential.

To dimension its workforce, POST Technologies will use a rolling forecast based on the orders received during the last 3-month period. No committed forecasts have to be provided by the Operator. POST Technologies will respect the installation time as specified in paragraphs 3.3.8 and 3.4.3 if the deviation from the aforementioned rolling forecast is less than 10%.

In case of major problems reported by an Operator, POST Technologies will provide, on request, to the ILR the detailed figures regarding the Operator's orders as well as the orders of POST Luxembourg's retail entity. In this case, the reason for major variations in the number of orders placed either by an Operator or POST Luxembourg's retail entity have to be provided, on request, to the ILR.

In case an Operator foresees a substantial increase in orders for either Bitstream or EtherConnect Services, POST Technologies will do every possible effort to respect the installation time as specified in paragraphs 3.3.8 and 3.4.3 by increasing the necessary workforce as far as the Operator informs POST Technologies hereof at least 3 months in advance.

3.2. Procedures for RHD Interconnections

Each order for an RHD interconnection has to be sent by the Operator to the following address

order.technologies@post.lu

and shall contain at least the following information:

- (i) Operator's name;
- (ii) Type of RHD (Bitstream / EtherConnect)
- (iii) Operator's contact point for this specific project including related e-mail address and telephone number;
- (iv) Address of the location where the RHD interconnection shall be provided;
- (v) Interface to be used;

POST Technologies shall confirm within five (5) business days the receipt of every firm order for an RHD interconnection and shall indicate an estimated ready for service date.

POST Technologies shall inform the Operator by e-mail as soon as the RHD interconnections are ready for service on POST Technologies' side.

3.3. Procedures for Bitstream Services

3.3.1. Ordering Procedures for Bitstream Services

3.3.1.1. Initial Request, Feasibility Check and Ordering

POST Technologies provides to the Operator via its Website access to a regularly updated database as well as an online tool to check the feasibility and availability of the Bitstream Services for the End Users. The database and online tool will include information on the technology (e.g. ADSL, VDSL, VDSL Bonding, G.fast, GPON) to be used for the implementation of the Bitstream Access at the End User's premises, the maximum bandwidth attainable at the specified address as well as the actual throughput measured on existing circuits.

POST Technologies' Website will also provide detailed information about the evolution of POST Technologies' infrastructures consisting mainly of

- (i) planned completion dates of ongoing and planned FTTH projects;
- (ii) planned dates for the activation of new Area POPs;
- (iii) closing dates of Local Exchanges and street cabinets;
- (iv) other useful information about planned or ongoing network modifications.

In case of a new building which is not yet connected to POST Technologies' network infrastructure (copper or fibre), the Operator can also send a request to POST Technologies on behalf of its End User for the building's connection to POST Technologies' Network, using the related form available on POST Technologies' Website.

The End User has to confirm in writing to the Operator he's being informed that the equipment installed in relation with the building's connection to POST Technologies' Network remains the property of POST Technologies and can also be used to provide services to other Operators and/or End Users.

Upon first request, notably in case of doubt or claim, the Operator shall provide to POST Technologies within a maximum of five (5) Business Days, a copy of the above-mentioned confirmation.

The costs in relation with the building's connection to POST Technologies' Network will be billed to the Operator according to POST Technologies' applicable price structure for underground network connections.

POST Technologies will provide information to the Operator about the type of infrastructure which will be deployed at the End User's premises (fibre and/or copper) and the Bitstream Service Profiles which will be available upon completion of the underground connection. For copper connections estimations are based on theoretical values and may partially differ from the values measured on actual Bitstream Services upon final completion of the underground connection.

The Operator will have the possibility to ask for a quote on behalf of its End User in order to have a site connected to POST Technologies' fibre network, in case POST Technologies' feasibility check indicates that either no Bitstream Service or only a lower-bandwidth Bitstream Service is currently available at the End User's site and that an FTTH infrastructure is either not yet planned for this site or that its projected completion date does not meet the requirements of the End User. The Operator shall send a request via e-mail to POST Technologies at the following address:

quote.technologies@post.lu .

This request must contain at least the following information:

- (i) Operator's name;
- (ii) Operator's contact point for this specific request including related e-mail address and telephone number;
- (iii) address of the site/building to be connected to POST Technologies' FTTH network

POST Technologies will perform a detailed analysis and submit an answer to the Operator within a period of ten (10) Business Days if no site survey is required. In case the site can be connected to POST Technologies' Fibre network, POST Technologies will send a quote to the Operator mentioning the costs and the approximate lead time for the fibre access.

The End User shall directly order any services requiring a Bitstream Service from his/her Operator, which shall then order the Bitstream Service from POST Technologies. Before signing a contract with the End User, the Operator shall inform him/her of the procedures and responsibilities related to the new service and the impact the Bitstream Service may have on his/her existing telecommunication services. POST Technologies will in no case accept or handle any order for a Bitstream Service issued directly by an Operator's End User. The Operator will be POST Technologies' single point of contact regarding orders for Bitstream Services.

In case of doubt or any claim by the End User or any other operator concerned by the Operator's request for a new Bitstream Service, the Recipient Operator will provide at first request and within a period of five (5) Business Days valid proof of its customer's consent by submitting the original order form signed by the End User.

3.3.1.2. Order Acceptance and Processing

The exchange of information related to the ordering process for Bitstream Services shall be done exclusively by means of a Web Service Application.

To be accepted, the structure of the transmitted messages shall be compliant with POST Technologies' specifications and instructions. For this purpose, a complete documentation describing the Web Service Application/SOAP interface and the procedures for the exchange of messages between the Operator and POST Technologies related to Bitstream Services will be published and timely updated as appropriate on POST Technologies' Website. A series of tests will have to be carried out before the first order can be transmitted.

Between the Operator's declaration of interest in Bitstream Services and the first order to be accepted by POST Technologies, a period of twenty (20) Business Days is foreseen for the setup, execution and validation of test scenarios. In order to meet the proposed deadline, the Operator shall fully cooperate with POST Technologies and the Parties shall mutually agree on a time schedule for the test period.

Orders will be deemed invalid when they either do not include all required mandatory information as specified in the above-mentioned documentation and/or contain erroneous or incompatible information. Any invalid orders will be rejected and not be processed by POST Technologies, which shall inform the Operator thereof. POST Technologies shall not be held liable for any delays caused in this way nor for any consequences arising out of or in relation to such an order rejection.

In case POST Technologies validates and accepts the Operator's request, POST Technologies will send a confirmation message to the Operator within one (1) Business Day and reserve the physical

infrastructure (e.g. fibre, copper pair) necessary for the realisation of the Bitstream Service for a period of up to twenty (20) business days. POST Technologies will provide to the Operator an order reference and a Bitstream Service reference number enabling the Operator to book an available time slot in the "Booking Manager" (cf. paragraph 3.3.1.3) within a period of twenty (20) business days. If the Operator does not book a time slot within this period or has not previously opted for a "One Technician" or a "Do-It-Yourself" installation (cf. paragraph 3.3.2.2), POST Technologies will cancel the order and charge the Operator the amount as set out in Schedule 6 for such a cancellation.

Other causes for rejection could be that

- (i) a Bitstream Service is already active or ordered by another Operator for the End User on the Access Line concerned; or
- (ii) another service incompatible with the Bitstream Service is already active or ordered for the End User on the Access Line; or
- (iii) the Access Line is already unbundled to another Operator.

In any such case of rejection, POST Technologies will inform the Operator thereof, which shall refer to the procedures for a Migration request.

A list of the possible causes for the rejection of a Bitstream Service order will be published on POST Technologies' Website.

POST Technologies will handle the Operator's new orders, cancellations and/or change requests in a non-discriminatory way and based on the "first come - first served" principle.

Incomplete and/or non-compliant orders or requests will be rejected and consequently not handled by POST Technologies, while similar requests may be grouped in order to allow mass processing.

3.3.1.3. Booking of Time Slots for Bitstream Service Provisioning

The installation of Bitstream Services requires the coordination of time schedules between POST Technologies, the Operator and the End User. The following description applies to the handling of on-site appointments related to the provision of Bitstream Services.

Each Operator will have to use POST Technologies' "Booking Manager" system. This web-based application allows the reservation by the Operator of an as yet available time slot for the installation of a Bitstream Service at the End User's premises. A detailed description of POST Technologies' "Booking Manager" is published and maintained on POST Technologies' Website. Bitstream Service installations will be carried out on Business Days between 8:00 and 12:00 and between 13:00 and 17:00.

The Operator will arrange directly with the End User an appointment for the installation of the Bitstream Service and reserve for this purpose an available time slot in POST Technologies' "Booking Manager",

To book a time slot, the Operator must indicate the order reference and the Bitstream Service reference it has received in the positive response to a valid request for the activation of a Bitstream Service.

The notification of an appointment by means of booking a time slot in the "Booking Manager" must be made no later than five (5) business days prior to the date of the appointment agreed on between the Operator and the End User.

The Operator also has the possibility to book a time slot as a "virtual appointment" in the "Booking Manager" on first contact with the End User, ahead of sending a formal request for a Bitstream Service to POST Technologies. The Operator has to send the corresponding Bitstream Service order within five (5) Business Days to POST Technologies indicating the virtual appointment reference number (VA#) received from the "Booking Manager" tool. If the VA# indicated in the order for the Bitstream Service matches the VA# of the reserved time slot in the "Booking Manager" tool, the chosen time slot will be confirmed by sending a confirmation message via the webservice interface.

On the day of the appointment, access to the End User's premises must be provided to POST Technologies' staff in order for them to install the termination equipment and to test the quality of the line. If the End User fails to keep a scheduled appointment for more than three (3) times in a row, the order for the Bitstream Service will be cancelled. The Operator can submit a new request after clarification of the situation with its End User.

If an appointment duly notified to POST Technologies cannot be kept, the Party responsible for the cancellation will inform the other Party thereof without any delay and the Parties will agree on the adequate measures to be taken.

No fee will be charged if a duly notified appointment is cancelled or changed by the Operator before 16:00 of the business day preceding the scheduled appointment. Beyond this period, POST Technologies will charge for any cancellation of an appointment the installation fee for this service as set out in Schedule 6. In case POST Technologies cancels a scheduled appointment after 16:00 of the business day preceding the appointment, POST Technologies will not invoice the fee due for the installation carried out at a later date.

3.3.2. Installation Procedures for Bitstream Services

3.3.2.1. Installation Services

The installation of a Bitstream Service by POST Technologies at the End User's premises on behalf of the Operator expressly includes:

- (i) all works necessary to configure the Bitstream Service and connect the circuit from the demarcation point at the End User's premises (Ethernet interface of the ONT in case of a GPON infrastructure, copper pair(s) of the NTP in case of an xDSL infrastructure) through to the RHD;
- (ii) the tests required to ensure operability of the Bitstream Service after installation, provided both Passive and Active Equipment are ready and in working condition at the End User's premises at the agreed activation date; and
- (iii) in case of an xDSL installation, on an optional basis, the delivery and installation of the splitters at the End User's premises in close connection of the NTP and preparation of the connection to the End User's xDSL modem.

The installation of a Bitstream Service by POST Technologies on behalf of the Operator expressly excludes:

- (i) any installation of new cabling at the End User's premises;

- (ii) activation of any additional services (e.g. telephony or TV services);
- (iii) installation of an additional connector or outlet at the End User's premises;
- (iv) supply and installation of a modem or router and/or of any related accessories;
- (v) configuration in whole or in part of the End User's Active Equipment; and
- (vi) any other task, works and/or duty not expressly included in the first list specified here above.

For Bitstream Service installations at the End User's premises, the Operator may opt, at its discretion and unless prevented by technical constraints specific to the End User's site, for the on-site installation to be carried out either by

- (i) POST Technologies' specialised technicians; or
- (ii) the Operator's own staff ("One Technician") or the End User himself/herself ("Do-It-Yourself Installation"), all this in compliance with the terms and conditions set forth below.

One Technician (OT) installations are currently only available for Fibre-based Bitstream Services. Do-It-Yourself (DIY) installations should only be used in case of existing circuits which are replaced by new Bitstream Services which use the same routing at the End User's NTP or FO-NTP.

All installation services provided by POST Technologies will be invoiced according to the terms set out in Schedule 6.

3.3.2.2. One Technician and Do-It-Yourself Installations

"One Technician" (OT) and "Do-It-Yourself" (DIY) Installations allow the Operator and/or the End Users to proceed by themselves with the initial installation of the Bitstream Services without the intervention of a POST Technologies technician at the End User's site.

In case of OT or DIY Installations, POST Technologies will not carry out any work at the End User's premises and its responsibilities will be limited to the logical configuration of the Bitstream Services in its network as well as the necessary interventions within its POPs, Local Exchanges and/or street cabinets for the physical connection of the NTP or FO-NTP from the End User sites to POST Technologies' active access network equipment.

In case of Fibre-based installations, POST Technologies will also provide to the Operator the ONT equipment which acts as the demarcation point at the End User's premises, so that the Operator may carry out the on-site installations on its own, including the installation of said ONT equipment, without any additional interventions from POST Technologies at the End User's site. POST technologies will also provide the Operator with the necessary tools to allow for activation and testing of the Bitstream circuits when carrying out the installation at the End User's site.

In the case of DIY Installations, the Operator shall make available to its End Users the necessary equipment required for the installation by the End User at his/her premises, together with all instructions and eventually with the support of the Operator or a third party acting under the Operator's responsibility.

The Operator is solely responsible for providing the appropriate technical support to its End Users and shall in all cases remain the single point of contact for OT and DIY Installations and all questions and/or issues related thereto.

POST Technologies shall in no case provide any support to the Operator's End Users in relation to the Bitstream Service installation when the Operator has opted in favour of an OT or DIY Installation.

In case of choosing the OT or DIY Installation, the successful activation and operation of the Bitstream Service cannot be guaranteed as these strongly depend, among others, on the in-house installations (cabling, equipment) at the End User's premises and on the distance between the End User's in-house installation and the DSLAM in POST Technologies' access network.

The Operator shall inform the End User accordingly and shall refund the DIY Installation to its End User in such cases, where due to the above-mentioned reasons the activation and operation of the Bitstream Service is not possible or the installation by specialised POST Technologies staff is needed. In these cases, Bitstream Service installation failure shall not be considered nor construed as a network fault and POST Technologies shall not be held liable for any additional costs incurred by the Operator or its End User to properly achieve the Bitstream Service installation.

After a successful activation of the Bitstream Service, POST Technologies will ensure the related maintenance and fault clearance as defined in Schedule 4. Nevertheless, the Operator shall remain solely and fully responsible for errors and/or malfunctions detected after the above-mentioned activation date which are directly or indirectly related to a wrongful installation, in whole or in part, by the Operator or by the End User during OT or DIY Installations.

As a consequence of the above, POST Technologies shall not be held liable for any direct or indirect damages caused by or in relation to a Bitstream Service perturbation or delay caused in whole or in part by works done by the Operator or the End User.

The Operator may still order POST Technologies' intervention to install the Bitstream Service, after the Operator or the End User has failed to properly activate the installation himself. In this case POST Technologies will charge the Operator with the applicable costs for

- (i) all works performed, including travel costs, pursuant to applicable tariffs in Schedule 6 of this ROB, except where the installation problems via the OT or DIY Installation were caused due to problems related to POST Technologies' Network; and
- (ii) all additional equipment and material used to achieve the said installation.

If no information was available at the time of ordering on existing in-house cabling compatible with fibre-based Bitstream Services at the End User premises or if the available information was incorrect, Bitstream Service orders may be modified free of charge until the time of installation from the selected fibre-based infrastructure to an xDSL-based technology, if a copper infrastructure is still operational at the End User premises.

3.3.2.3. Service Activation in case of One Technician or Do-It-Yourself Installations

The DSL splitters required for a Do-It-Yourself Installation can be purchased by the Operator from POST Technologies or the Operator can use its own equipment. However, this equipment has to comply with the specifications published on POST Technologies' Website. The ONT equipment required for Fibre-based One Technician Installations is provided at no additional charge by POST Technologies to the Operator as it is an integral part of the Bitstream Service.

The Bitstream Service activation for DIY installations will be performed on the due date requested by the Operator in its valid Bitstream Service activation order. The earliest possible due date in this respect is on the fifth (5) Business Day after valid order submission.

The Operator shall ensure that the Passive (splitter, in-house cabling) and Active Equipment (modem/router) are already properly installed at the End User's premises before the said due date.

The Bitstream Service activation will be processed automatically between 8:00 and 17:00 on the requested due date. During that time period, the End User's Active Equipment shall be turned into working mode (power on), enabling thus POST Technologies to control the well-functioning of the related Bitstream Service and to carry out the necessary remote measurements.

POST Technologies will endeavour to achieve on the Operator's requested due date at least 95% of all validly ordered Bitstream Service activations.

Despite any line control failure by POST Technologies on the due date due to the fact that the Active Equipments at the End User's premises were not ready or were not in working mode, POST Technologies will proceed with the automatic activation of the concerned Bitstream Service.

An activation report will be sent to the Operator and the invoicing of the Bitstream Service to the Operator will start on the date of the Bitstream Service activation.

One Technician Installations do not require the booking of an installation time and date as the activation of the Bitstream Service will be triggered by the Operator's technician using the tools and applications made available by POST Technologies to the Operator for this purpose, when on site and after connecting the ONT to the FO-NTP. POST Technologies will endeavour to achieve for at least 95% of all OT installations the completion of all works (e.g. patching and connections at ODF level) within five (5) Business Days following the successful order validation for said Bitstream Service.

After service activation, the Operator will use the tool received by POST Technologies to test the connection and the invoicing of the Bitstream Service to the Operator will start on the date the Operator has triggered the activation.

3.3.2.4. Installation of a Bitstream Service with Modem supplied by POST Technologies

The Bitstream Service on copper infrastructures terminates at the NTP at the End User's premises and does not include the provision of an xDSL modem to deliver the service to the End User. In order to facilitate troubleshooting and avoid compatibility issues between POST Technologies' and the Operator's chosen network components in case of xDSL-based Bitstream Services, POST Technologies will provide a commercial offer upon dedicated request from the Operator for an alternative installation consisting in a 2-box solution where POST Technologies supplies an xDSL modem equipped with a standardised Ethernet Interface for the connection of the Operator's own CPE (HAG).

3.3.2.5. Cancellation of a Bitstream Service before Activation

If an Operator wants to cancel its order for a Bitstream Service after its formal submission via the Web Service Application, it shall send the corresponding order cancellation message to POST Technologies as specified in POST Technologies' procedures applicable to Bitstream Services.

If the order cancellation is received by POST Technologies not later than 16:00 of the last business day before the appointment date registered in the "Booking Manager" system, POST Technologies will cancel the order and the Operator will be charged according to the tariff for cancellation of an order before activation as defined in Schedule 6.

In case POST Technologies receives the cancellation later than 16:00 of the last business day before the appointment date, POST Technologies will cancel the order and the Operator will be charged the full installation tariff for a Bitstream Service as defined in Schedule 6.

3.3.3. Procedures for the Migration of a Bitstream Service from a Donor Operator to a Recipient Operator

3.3.3.1. Migration Ordering Process

A Migration consists of the change of ownership of the Bitstream Service from the current operator (the "Donor Operator") to a new operator (the "Recipient Operator"). As such, the prerequisite of a Migration is that a Bitstream Service already exists on the End User's Access Line and that no modification of the Access Line or an on-site intervention by POST Technologies' field technicians is required.

The Migration aim is to change ownership of the Bitstream Service without extended service interruption for the End User. Therefore, Migration is handled as a special case and not like a cancellation request followed by a new order.

The main Migration process steps are as follows:

- (i) The Recipient Operator informs the End User that he/she is bound by the terms and conditions of his/her contract to the Donor Operator and that a premature termination of this contract can result in the payment of penalties and/or remaining contractual fees to the Donor Operator. The End User has to confirm in writing to the Recipient Operator that he/she cancels the current service provided by the Donor Operator in compliance with applicable contractual obligations between himself/herself and the Donor Operator.

The End User has to confirm in writing to the Recipient Operator his/her request for a Migration as well as the name of the Donor Operator. Upon the Donor Operator's request, the Recipient Operator shall provide within a maximum of five (5) Business Days, notably in case of doubt or claim, a copy of the above-mentioned confirmation.

- (ii) The Recipient Operator will send a Migration request to the Donor Operator.
- (iii) The Donor Operator will reply in writing by mail, fax or e-mail to the Recipient Operator within a maximum of ten (10) Business Days by specifying that:
 - a. the End User is authorised to migrate, indicating POST Technologies' current Bitstream Service reference and the authorised Migration date; or that
 - b. the End User is still bound by the terms of an ongoing agreement, while the Donor Operator shall in such case formally specify to the Recipient Operator in the said reply the first date when the End User is duly allowed to migrate.

Failing to reply formally and validly to the Recipient Operator within the applicable timeframe, the Donor Operator shall be deemed as having duly confirmed its authorisation for the End User to being migrated to the Recipient Operator.

- (iv) After due compliance with the respective principles of both Steps (i) to (iii) set forth here above, the Recipient Operator may send electronically a Migration request to POST Technologies as specified in POST Technologies' procedures applicable to Bitstream Services, indicating the existing Bitstream Service reference and the due date for its Migration. The due date for the Migration of the Bitstream Service shall not exceed the period of 3 months from the day of receipt of the order.
- (v) A Migration request will be rejected in any of the following cases:

- a. the indicated current Bitstream Service does not exist or is not active on the given Access Line;
- b. the given Access Line is inactive or currently disturbed or disrupted;
- c. the given Access Line is unbundled or used for shared access as defined in the applicable RUO;
- d. another Bitstream Service order for the same Access Line is already being processed;
- e. the related Migration request is incomplete, incoherent and/or not conforming to the ordering process described in POST Technologies' procedures applicable to Bitstream Services.

(vi) Further to its acceptance by POST Technologies, the Bitstream Service order will be processed by POST Technologies at the indicated due date, without any supplementary authorisation from the Donor Operator being required or necessary in this respect. After execution of the Migration, the Recipient Operator as well as the Donor Operator will be informed by electronic means about the outcome of the Bitstream Service Migration.

The same procedure applies to Migrations of existing DSL or ATH services purchased under the terms of the RDSLO and ORATH offers, if no modification of the Access Line or an on-site intervention by POST Technologies' field technicians is required. For DSL services two scenarios will have to be distinguished:

- (i) Migration of a "naked" DSL service not linked to an existing PSTN line: the same procedures as for Bitstream Services will be applied;
- (ii) Migration of a DSL service bundled with an existing PSTN line:
 - a. upon the End User's request for number portability, the Operator also mentions the geographic phone number to be ported in conjunction with the Bitstream Service. The existing PSTN line will be deactivated at the time of Migration.
 - b. if the End User prefers not to change operators for his/her telephony services, the existing PSTN line will remain in place and the new Bitstream Service will be deployed on a separate Access Line. In this case the procedures for Migration do not apply and the Operator shall send a regular order for a new Bitstream Service to POST Technologies, while the End User will have to cancel himself/herself the (DSL) services provided by the third party operator.

The Migration procedures do not apply to orders requiring a modification of the Access Line or an on-site intervention by POST Technologies' field technicians. In this case the Operator must send an order for a new Bitstream Service and follow the procedures for new Bitstream installations.

3.3.3.2. Disputes in relation to a Migration

In case any dispute between the Donor Operator and the Recipient Operator arose in relation to a Bitstream Service Migration, involving or not the End User concerned, the said dispute shall be exclusively settled between the Recipient Operator, the Donor Operator and, if applicable, the End User.

In case a dispute cannot be amicably settled between the parties as specified here above or in case of any problems encountered by either of the concerned Operators and provided it duly justifies its request, the Donor Operator is entitled to request in writing to POST Technologies a copy of the Migration request submitted by the Recipient Operator, while POST Technologies is

duly authorised to transfer this request as well as the Recipient Operator's identity to the Donor Operator.

In addition, POST Technologies is entitled to request from the Recipient Operator due evidence of the End User's agreement as to the Migration, which the Recipient Operator shall provide within a maximum of five (5) Business Days after POST Technologies' said request.

POST Technologies shall in no case be held responsible by the Donor Operator for the implementation of a valid Migration request by the Recipient Operator and shall be kept free and harmless by both the Donor Operator and the Recipient Operator from any claims or damages in connection with the execution of aforementioned Migration request.

3.3.3.3. Billing in relation to a Migration

The Donor Operator will continue to be invoiced for the Bitstream Services until the last day before the effective Migration date, whereas the invoicing of the Recipient Operator will start as from the day of said Migration.

The Migration of the Bitstream Service will be invoiced to the Recipient Operator according to the tariffs set out in Schedule 6.

3.3.4. Modification of a Bitstream Service

A request for modification of an active Bitstream Service and its parameters can be sent at any time by the Operator to POST Technologies via the Web Service Application according to the relevant procedures.

Any compliant order for modification, which can be carried out remotely without any modification of the Access Line or an on-site intervention by POST Technologies' field technicians, shall be executed within one (1) Business Day. POST Technologies will proceed with the automatic activation of the new Bitstream Service Profiles or parameters between 8:00 and 17:00 on the requested due date. In case installations have to be carried out on site, the Operator has to book a time slot through the "Booking Manager" system or follow the procedure for One Technican Installations.

An activation report will be sent to the Operator and the invoicing of the modified Bitstream Service will start on the date of the Bitstream Service modification.

The same procedures and lead times also apply in case the Operator requests the modification of an existing service purchased under the terms of the RDSLO and ORATH offers without any modification of the Access Line or an on-site intervention by POST Technologies' field technicians.

Only in case of RDSLO services, two scenarios will have to be distinguished:

- (i) Conversion of a "naked" DSL service not linked to an existing PSTN line: the same procedures as for modifications of Bitstream Services will be applied and the old RDSLO DSL service profile will be replaced by a new Bitstream Service Profile on the due day for the modification;
- (ii) Conversion of a DSL service bundled with an existing PSTN line:
 - a. if the PSTN line is directly invoiced to the End User by POST Luxembourg's retail entity and the End User agrees to the number portability, the Operator also mentions the number to be ported in the Bitstream order and follows all the

procedures related to number portability. The PSTN line will be deactivated at the time of implementing the new Bitstream Service.

- b. if the PSTN line is directly invoiced to the End User by POST Luxembourg's retail entity and the End User does not agree to the porting of the number, the PSTN line will remain in place and the Operator will have to send an order for a new Bitstream Service to be installed on a separate Access Line as well as a cancellation order for the existing DSL service.
- c. If the PSTN line is invoiced to the Operator, the Operator also mentions the number to be ported in the Bitstream order. The PSTN line will be deactivated at the time of implementing the new Bitstream Service.

For all change requests requiring a modification of the Access Line or an on-site intervention by POST Technologies' field technicians, the Operator must send an order for a new Bitstream Service and follow the procedure for new Bitstream installations. The Operator will also have to send a cancellation order for the existing service.

3.3.5. Move Request of a Bitstream Service

In case the Operator wants to move an End User's Bitstream Service to a different site, it will submit an order for a new Bitstream Service at the new address and a cancellation order for the existing Bitstream Service.

3.3.6. Cancellation of a Bitstream Service

A Bitstream Service cancellation request may only be sent by the Operator to POST Technologies if so requested expressly by the End User or in case of contractual breach by the End User.

In addition, the Operator undertakes not to send a cancellation request to POST Technologies in case he has previously received a valid Migration request from another Operator.

A Bitstream Service cancellation will be carried out within the timeframe agreed between the Parties. The due date for the cancellation of the Bitstream Service shall not exceed the period of 3 months from the day of receipt of the cancellation request.

In case the cancellation is carried out before the end of the initial minimum contract period for said Bitstream Service, the Operator will be charged for the entire remaining contract period.

The minimum contract period for all Bitstream Services is 6 months. Requests for temporary installations of a Bitstream Service with a duration shorter than the minimum contract period will be handled as a standard request for a new Bitstream service and a subsequent premature cancellation of this temporary service will lead to the invoicing of the monthly charges for the remainder of the initial minimum contract period.

3.3.7. Relation with Local Loop Unbundling (LLU) Services

Bitstream Services cannot be offered by POST Technologies on an unbundled copper- or Fibre-based Access Line. As a consequence, in case of a third party's request for LLU Services on an Access Line where a Bitstream Service is provided, POST Technologies, upon receipt of such an operator's request for LLU Services, will have to cancel the existing Bitstream Service prior to activating the requested LLU Services. The third party operator will have to request the authorisation of the Operator for the cancellation of the Bitstream Services in much the same way as for the Migration of an active Bitstream Service.

For the avoidance of doubt, the Operator may not request any cancellation fees from POST Technologies as a consequence of the above, irrespective of its eventual contractual obligations with its End User.

3.3.8. Lead Times for Bitstream Service Activation

3.3.8.1. Lead Times for Standard Requests

The following table summarises the lead times for the various steps in the provisioning process leading up to the Bitstream Service activation.

Order type	Lead time
Response time (validation/rejection) to a Bitstream Service activation request	1 Business Day
Earliest activation date (Booking Manager slot) for a Bitstream Service installation from the date of submission of the activation request	5 Business Days
Installation or modification of a Bitstream Service with on-site intervention by POST Technologies' field technicians	95 % of all installations will be carried out on the due date as requested by the Operator *)
Time period for executing 95 % of valid Migration requests from Donor to Recipient Operator	5 Business Days
Time period for executing 95 % of all installations or modifications of Bitstream Services after successful order validation not requiring any intervention at the End User site (including "One Technician" installations)	5 Business Days
Implementation of an RHD link to POST Technologies-sited co-location facilities	60 Business Days
Implementation of an RHD link extension to non-POST Technologies-sited datacenter of the Operator	on quote
CIR traffic configuration in POST Technologies' backbone for tailor-made Bitstream Service Profiles	on quote

Table 25: Lead times for Bitstream Services

*) POST Technologies ensures that enough Booking manager slots will be available so that all installations can be scheduled within a timeframe of 20 Business Days at the time of ordering (using a 3-month rolling forecast based on Operators' current number of orders for Bitstream installations)

The invoicing of the Bitstream Service to the Operator will start on the date on which POST Technologies activates the Bitstream Service. An activation report will be sent to the Operator.

3.3.8.2. Rush Orders for Bitstream Services

An Operator may request a Rush Order for new Bitstream Services provided that the Operator has first submitted a valid request for this Bitstream Service via the Web Service application, followed by a positive response by POST Technologies.

In order to request a Rush Order for this Bitstream Service, the Operator sends an e-mail to

backoffice.technologies@post.lu

which contains at least the following data:

- (i) the mention of the words RUSH ORDER in the subject of the e-mail

- (ii) Bitstream Service reference number
- (iii) order reference
- (iv) contact point, e-mail address and phone number of the Operator
- (v) contact point and phone number of the End User
- (vi) type of Rush Order requested
- (vii) preferred installation time

POST Technologies offers 3 types of Rush Orders:

- (i) Type 1: Activation within 2 Business Days after the related Rush Order e-mail has been received by POST Technologies
- (ii) Type 2: Activation within 3 and 5 Business Days after the related Rush Order e-mail has been received by POST Technologies
- (iii) Type 3: Activation within 6 and 10 Business Days after the related Rush Order e-mail has been received by POST Technologies

The Rush Order service will be invoiced according to the tariffs as set out in Schedule 6 of this ROB.

The Operator may propose an appointment within the before mentioned time frame which POST Technologies should respect under the condition that POST Technologies' field technicians are available at the proposed time. If that is not the case, POST Technologies will fix another appointment within the same time frame.

POST Technologies will reply to the Operator's Rush Order request within a time frame of 4 Business Hours after receiving the Rush Order e-mail. The message will contain the definitive date and time of the Rush Order appointment.

Rush Order installations will only be carried out on Business Days between 8:00 and 12:00 and between 13:00 and 17:00.

The Operator has to ensure that the End User is informed of the exact date and time of the Rush Order installation, that access to the NTP, FO-NTP and/or ONT is guaranteed and that the in-house cabling at the End User's premises is ready. If the installation cannot be carried out by POST Technologies' staff because of reasons beyond POST Technologies' control (e.g. End User's absence, no access to the NTP/ONT, cabling not ready) despite the appointment made with the End User, POST Technologies will duly report the cancellation of the Rush Order process to the Operator and activate the Bitstream Service within the standard lead times after the Operator has booked a new time slot via the "Booking Manager" system. The Rush Order, although failed, will be invoiced to the Operator.

3.4. Procedures for EtherConnect Services

3.4.1. Initial Request, Feasibility Check and Ordering

To cover all available technical options for the provision of higher-bandwidth EtherConnect Services, feasibility checks will be performed by POST Technologies upon receiving detailed information about the End User's location. Feasibility studies can also be requested in order to connect a building to POST Technologies' FTTO fibre network or to expedite its planned connection to POST Technologies' FTTH fibre network. Feasibility checks are also required before ordering an EtherConnect Backup Service in order to make sure that such a service fulfills the necessary requirements in terms of redundancy.

Until any specific other instruction from POST Technologies has been published, the Operator shall send a request via e-mail to POST Technologies at the following address :

checktech.technologies@post.lu

As from the date of entry into force of any such other instruction from POST Technologies, the Operator shall comply with the said instruction and related procedure if any. Failing to comply therewith, such request shall be held as invalid.

This request must contain at least the following information:

- (i) Operator's name;
- (ii) Operator's contact point for this specific request including related e-mail address and telephone number;
- (iii) address of the site/building to be connected via an EtherConnect Service;
- (iv) requested EtherConnect Service Profile; and
- (v) in case of requesting an EtherConnect Backup Service, information about a requested or existing primary EtherConnect Service shall be indicated as well.

POST Technologies will perform a detailed analysis and submit an answer with the available Ethernet Service Profiles to the Operator within a period of five (5) Business Days if no site survey is required. POST Technologies cannot commit to extend, modify or adapt its Network to enable the provision of a specific EtherConnect Service Profile. In case the building needs to be connected to POST Technologies' Network or an additional FTTO fibre entry has to be built for redundancy purposes, POST Technologies will send a quote to the Operator mentioning the costs and the approximate lead time for the related civil works.

In case the Operator orders this building's connection to POST Technologies' Network on behalf of the End User, the related costs will be billed to the Operator. The End User has to confirm in writing to the Operator he's being informed that the equipment installed in relation with the building's connection to POST Technologies' Network remains the property of POST Technologies and can also be used to provide services to other Operators and/or End Users.

Upon first request, notably in case of doubt or claim, the Operator shall provide to POST Technologies within a maximum of five (5) Business Days, a copy of the above-mentioned confirmation.

POST Technologies will provide information to the Operator about the type of infrastructure which will be deployed at the End User's premises (fibre and/or copper) and the EtherConnect Service Profiles which will be available upon completion of the underground connection.

The End User shall directly order any services requiring an EtherConnect Service from his/her Operator, which shall then order the EtherConnect Service from POST Technologies. Before signing a contract with the End User, the Operator shall inform him/her of the procedures and responsibilities related to the new service and the impact the EtherConnect Service may have on his/her existing telecommunication services. POST Technologies will in no case accept or handle any order for an EtherConnect Service issued directly by an Operator's End User. The Operator will be POST Technologies' single point of contact regarding orders for EtherConnect Services.

The Operator will send any firm order for a new EtherConnect Service or the modification or cancellation of an existing EtherConnect Service by e-mail to

order.technologies@post.lu

The order shall contain at least the following information:

- (i) the Operator's name;
- (ii) the Operator's contact point for this specific request including related e-mail address and telephone number;
- (iii) in case of modifications, moves or cancellations the existing EtherConnect Service reference number;
- (iv) the EtherConnect Service Profile (and options) to be implemented;
- (v) in case of an EtherConnect Backup Service, information about a requested or existing primary EtherConnect Service must be indicated as well;
- (vi) the RHD(s) on which the EtherConnect Service will be configured;
- (vii) the VLAN_ID to be used for the EtherConnect Service;
- (viii) End User installation address (for office buildings, datacenters or industrial sites: building, floor, room/rack, etc.);
- (ix) contact point with phone number and e-mail address of the End User;
- (x) in case of non-standard installations, reference of the feasibility check and acknowledgment of the additional costs;
- (xi) if required, request for the feasibility check of a Rush Order.

Similar requests may be grouped within the same order to allow mass processing.

Orders will be deemed invalid when they either do not include all required mandatory information as specified in the above-mentioned documentation and/or contain erroneous or incompatible information. Any invalid orders will be rejected and not be processed by POST Technologies, which shall inform the Operator thereof. POST Technologies shall not be held liable for any delays caused in this way nor for any consequences arising out of or in relation to such an order rejection.

In case POST Technologies validates and accepts the Operator's request, POST Technologies will send a confirmation to the Operator and reserve the physical infrastructure (e.g. fibre, copper pair) necessary for the realisation of the EtherConnect Service. POST Technologies will provide to the Operator an order reference and an EtherConnect Service reference number.

POST Technologies will make every effort to respond to ninety-five percent (95%) of all requests received for EtherConnect Services within a period of five (5) Business Days.

POST Technologies will handle the Operator's new orders, cancellations and/or change requests in a non-discriminatory way and based on the "first come - first served" principle.

If an Operator wants to cancel its order for an EtherConnect Service after its formal submission, it shall do so by sending an e-mail to backoffice.technologies@post.lu indicating POST Technologies' order reference and the EtherConnect Service's reference number. The Operator will be charged according to the tariffs for cancellation of an EtherConnect order before activation as defined in Schedule 6.

3.4.2. Installation Procedures for EtherConnect Services

The standard installation of a new EtherConnect Service by POST Technologies on behalf of the Operator expressly include, whenever required :

- (i) the installation of the physical Access Line(s) via an existing NTP or FO-NTP at the End Customer's premises including the delivery, installation and configuration of eventually required xDSL modems or an ONT;
- (ii) the supply and installation in an existing rack or suitable environment, in close proximity to the NTP, FO-NTP or ONT at the End User's premises, of the NTU, which acts as demarcation device for the EtherConnect Service delivered on one of its Ethernet interfaces;
- (iii) the supply and installation of the necessary patchcords and splitters to interconnect the NTU with the modem(s) and the existing NTP, or to interconnect the NTU with the ONT or the FO-NTP at the End User's premises, under strict exclusion of any internal cabling related supplies and/or services;
- (iv) all works necessary to configure and test the EtherConnect Service and connect the circuit from the demarcation point at the End User's premises (Ethernet interface of the NTU installed in close proximity to the NTP, FO-NTP or ONT) through to the RHD;
- (v) an initial site survey of the End User's premises (max. 1 hour) in order to determine the most suitable location for the installation of the equipment provided by POST Technologies (NTU, modems, ONT) and to verify whether the existing NTP or FO-NTP can be used or whether additional cabling works need to be carried out to enable the interconnection between the NTU and the (FO-)NTP.

The installation of an EtherConnect Service by POST Technologies on behalf of the Operator expressly excludes:

- (i) any installation of new cabling, outlets and/or patchpanels at the End User's premises;
- (ii) installation of a new NTP or FO-NTP at the End User's premises
- (iii) activation of any additional services;
- (iv) configuration in whole or in part of the End User's Active Equipment;
- (v) any other task, works and/or duty not expressly included in the first list specified here above.

As most of the EtherConnect Services are delivered to corporate End User's in multi-tenant buildings and/or dedicated IT rooms, an initial site survey is nearly always necessary to determine whether a new EtherConnect Service can be installed without any modifications in the End User's IT environment. As mentioned before, only the connection of the NTU to the NTP, ONT or FO-

NTP by means of patchcords is included in the installation services for EtherConnect Services. If the NTU cannot be installed in close proximity to the existing NTP, ONT or FO-NTP and installation of the NTU requires additional on-site or in-house cabling, these cabling works are the Operator's and/or the End User's responsibilities and will not be part of POST Technologies' scope of work.

230V/16A power supplies and earth connection have to be made available for the connection of POST Technologies' active equipment. All costs related to power consumption, rack space and/or footprints need to be borne by the Operator and/or its End User. POST Technologies has the right to refuse the installation if the Operator and/or the End User cannot provide a suitable environment compliant with the specifications for POST Technologies' equipment (e.g. operating temperature, humidity).

In case no modifications are required, POST Technologies will confirm an installation date while trying to comply with the preferred installation time as expressed by the Operator at the time of its order.

In case modifications or additional installations (e.g. new cabling or rack space required) are necessary to provide the EtherConnect Service at the chosen location within the End User's premises, POST Technologies and the Operator in agreement with the End User will set a new time schedule for the installation of the EtherConnect service.

If the modifications have not yet been carried out or only been carried out incompletely or incorrectly within the agreed time schedule, the Operator will inform POST Technologies thereof no later than 16:00 of the last business day before the agreed installation date. In case the Operator does not inform POST Technologies in time, POST Technologies will invoice the "no-show fee" as defined in Schedule 6.

In case the modifications on site require the installation by POST Technologies of a new NTP or FO-NTP at the End User's premises, POST Technologies will provide a quote within five (5) days to the Operator for the corresponding installation. While POST Technologies will include the supply and connection of the necessary cables in its quote, it will be the Operator's responsibility to ensure that the cables will be laid between the designated extremities within the premises. Upon receiving this quote, the Operator will have to confirm its acceptance by e-mail in order to re-validate the initial EtherConnect order and to relaunch its provisioning process.

EtherConnect Service installations will be carried out on Business Days between 8:00 and 12:00 and between 13:00 and 17:00.

The Operator will be notified by e-mail of the EtherConnect Service activation and invoicing will start on the activation date mentioned in this notification message.

POST Technologies will endeavour to achieve at least 95% of the Operator's requests for EtherConnect Services, which do not require a non-standard installation or any modifications at the End User's premises, within a maximum of forty (40) Business Days.

Modification and move requests of an active EtherConnect Service can be sent at any time by the Operator to POST Technologies after having carried out the necessary feasibility check for the new address or for bandwidth upgrades at the existing installation address.

If the activation of the new EtherConnect Service Profile can be carried out remotely without any modifications of the installations and infrastructures at the End User's premises or any Network modifications or upgrades, POST Technologies will inform the Operator thereof and proceed with the automatic activation of the new EtherConnect Service Profile between 8:00 and 17:00 on the

requested due date. In case installations have to be carried out on site or in case of a move to another site, the same procedures as for the installation of a new EtherConnect Service will apply.

After activation, the Operator will be notified by e-mail and the invoicing will be switched to the new EtherConnect Service on the date of the service modification.

A cancellation request for an EtherConnect Service may be sent by the Operator to POST Technologies if so requested by the End User or in case of contractual breach by the End User. An EtherConnect Service cancellation will be carried out within the timeframe agreed between the Parties. The due date for the cancellation of the EtherConnect Service shall not exceed the period of 3 months from the day of receipt of the cancellation request.

In case the cancellation is carried out before the end of the initial minimum contract period for said EtherConnect Service, the Operator will be charged for the entire remaining contract period.

The minimum contract period for all EtherConnect Services is 6 months.

3.4.3. Lead Times for EtherConnect Services

3.4.3.1. Lead Times for Standard Requests

The following table summarises the lead times for the various steps in the provisioning process leading up to the EtherConnect Service activation.

Order type	Lead time
Maximum response time to a feasibility check for an EtherConnect Service	5 Business Days
Maximum response time to a request for a new connection of a building to POST Technologies' network (not requiring a site survey)	10 Business Days
Target activation date for a new EtherConnect Service from the date of order submission	< 30 Business Days
Activation of an EtherConnect Service by a POST Technologies technical team with on-site installation (activation due date needs to be validated after site survey)	95 % of all installations will be carried out within the target activation period
Time period for executing 95 % of change requests for EtherConnect Services not requiring on-site interventions or network upgrades/modifications	15 Business Days
Implementation of an RHD link to POST Technologies-sited co-location facilities	60 Business Days
Implementation of an RHD link extension to non-POST Technologies-sited datacenter of the Operator	on quote

Table 26: Lead times for EtherConnect Services

The invoicing of the EtherConnect Service to the Operator will start on the date on which POST Technologies activates the EtherConnect Service. An activation report will be sent to the Operator.

3.4.3.2. Rush Orders for EtherConnect Services

An Operator may request a Rush Order for the activation of EtherConnect Services.

POST Technologies offers 3 types of Rush Orders for EtherConnect Services:

- (i) Type 1: Activation within 2 and 5 Business Days after validation of the related Rush Order
- (ii) Type 2: Activation within 6 and 10 Business Days after validation of the related Rush Order

(iii) Type 3: Activation within 11 and 15 Business Days after validation of the related Rush Order

The Rush Order service will be invoiced according to the tariffs as set out in Schedule 6 of this ROB.

The Operator may request a feasibility check prior to sending a firm order for the required EtherConnect Services. This request shall be sent by e-mail to

backoffice.technologies@post.lu

containing the following information:

- (i) the mention of the words RUSH ORDER in the subject of the e-mail
- (ii) the Operator's name;
- (iii) the Operator's contact point for this specific request including related e-mail address and telephone number;
- (iv) in case of moves or modifications the existing EtherConnect Service reference number;
- (v) the EtherConnect Service Profile (and options) to be implemented;
- (vi) in case of an EtherConnect Backup Service, information about a requested or existing primary EtherConnect Service must be indicated as well;
- (vii) End User installation address (for office buildings, datacenters or industrial sites: building, floor, room/rack, etc.);
- (viii) contact point, phone number and e-mail address of the End User;
- (ix) type of Rush Order requested;
- (x) preferred installation day and time.

POST Technologies will inform the Operator within one (1) Business Day about the feasibility of the requested expedite service activation unless the feasibility analysis requires a site survey. In that case POST Technologies will contact the Operator within one (1) Business Day after receiving the Operator's request in order to schedule an appointment for the related site survey. Feasibility checks for Rush Orders will be invoiced according to the tariffs as set out in Schedule 6.

The request for a feasibility check can also be sent together with the firm order for an EtherConnect Service. In this case the order will only be validated after receiving the positive result of the feasibility check.

The Operator has to ensure that the End User is informed of the exact date and time of the Rush Order installation, that access to the NTP, FO-NTP and/or ONT is guaranteed and that the in-house cabling at the End User's premises is ready. If the installation cannot be carried out by POST Technologies' staff because of reasons beyond POST Technologies' control (e.g. End User's absence, no access to the NTP/ONT, cabling not ready), POST Technologies will duly report the cancellation of the Rush Order process to the Operator and activate the EtherConnect Service within the standard lead times. The Rush Order, although failed, will be invoiced to the Operator.

3.5. Key Performance Indicators

POST Technologies will measure applicable Broadband Services KPIs and inform the ILR in compliance with Regulation ILR/T19/1 from 13th March 2019.

3.6. Non-standard Requests

In case of non-standard requests related to Bitstream or EtherConnect Services which demand either a feasibility study including a detailed analysis of the Operator's requirements as well as an evaluation of the technical and financial aspects of a tailor-made implementation and the potential impact on processes and operations or any other special requests (including the request of the Operator to obtain other profiles for Bitstream and EtherConnect services than those laid down in the present ROB), POST Technologies will bill the supplementary efforts on an hourly basis as defined in Schedule 6 and will, subject to the outcome of the feasibility study or its assessment, make its best efforts to conclude an agreement with the Operator within a maximum of 3 (three) months after receiving from the Operator all the information required.

Schedule 4 Fault Repair and Reporting

4.1. POST Technologies' Fault Contact Point, Fault Acceptance and Billing

The Operator shall send a Fault Report to POST Technologies' Fault Contact Point (FCP) by creating a fault ticket in POST Technologies' Service Portal/Ticketing Tool.

This Service Portal allows the Operator to perform the following operations :

- (i) Create tickets
- (ii) Update tickets
- (iii) View tickets (list view and detailed view)
- (iv) Search tickets by service reference
- (v) Escalate tickets

For the time being, the Operator may also send an e-mail to the following address :

bo.networkoperations.technologies@post.lu

In case of a Bitstream Service covered by a Business SLA or an EtherConnect Service (cf. paragraph 5.1.2), e-mails should be sent to

noc@post.lu

for immediate handling of the fault ticket.

Updated lists of Fault Contact Points (e.g. phone numbers, e-mail addresses, ...) will feature on POST Technologies' Website and will also be handed over to the Operator at the time of signing the Broadband Agreement.

In the future, the use of e-mails may be abandoned in favour of the exclusive use of the Service Portal for fault ticket creation.

Upon receipt of a valid Fault Report compliant to the minimum terms set forth below, POST Technologies shall send an email notification ("Incident Ticket Opening") related to a valid Fault Report to the Operator. To do so, the Operator shall provide POST Technologies with an e-mail address for the exchange of these notification messages. After fault resolution an e-mail notification ("Incident Ticket Closing") will be sent to the same address.

Operator's Fault Reports will be accepted by POST Technologies 24 hours a day, 7 days a week.

Fault clearance for all Broadband Services will be performed during normal Business Days, Mondays to Fridays from 8:00 to 12:00 and from 13:00 to 17:00.

Fault clearance shall be performed on Business Days outside of Business Hours as well as on Saturdays, Sundays and/or legal and public holidays for all Broadband Services for which the Operator has chosen an enhanced Service Level as defined in Schedule 5.

Fault clearance interventions will be billed by POST Technologies to the Operator as defined in Schedule 6.

Fault reporting and fault repairs shall be performed in compliance with the conditions and time schedules specified hereafter.

Only valid Fault Reports and accepted faults will be processed by POST Technologies. To be valid, a Fault Report shall contain the minimum information and data requested in the paragraphs below.

4.2. Fault Reporting to POST Technologies by the Operator

Prior to submitting a Fault Report, the Operator shall have to ensure that a genuine fault exists and that every effort has been made in advance to check that the fault resides within POST Technologies' area of responsibility.

In order to allow the diagnosis of the reported fault and to enable the progression of the fault until resolution, the Operator's Fault Report shall provide sufficient information including at least the following data:

- (i) POST Technologies' reference number of the Broadband Service or RHD
- (ii) Contact point and phone number of the End User, unless the Operator does not approve of POST Technologies entering into direct contact with the End User. In this case the Operator indicates its own contact point and phone number for further investigations.
- (iii) Address of the End User
- (iv) Contact point and phone number of the Operator
- (v) Type of service affected
- (vi) Description of the reported fault
- (vii) Date and description of the intervention of the Operator's technician

The Operator may pass on any additional information it considers relevant to the Fault Report, while POST Technologies shall not be obliged to use such additional information, whichever may be the reason.

Incident Ticket Opening and Incident Ticket Closing notifications are automatically generated and triggered by POST Technologies' Broadband Service or RHD reference number. If this field is not indicated in the Operator's Fault Report, no incident ticket will be opened, while the concerned Fault Report will be deemed invalid.

In case of xDSL-based Bitstream Services, POST Technologies reserves the right to reject Fault Reports without further investigation if the synchronisation speed of the xDSL circuit varies by less than 25% of the speed measured at the time of its initial installation as available maximum bandwidth of xDSL circuits may vary in time due to a changing cable fill rate.

4.3. Fault Reporting to POST Technologies by the End User

The Operator has to inform the End User about the Operator's responsibility and timely communicate the Operator's own Fault Contact Point to the End User in order to prevent any abuse of POST Technologies' support services.

POST Technologies will not accept any Fault Report from the Operator's End Users. POST Technologies has no obligation to report to the Operator a fault that an End User would have directly reported to POST Technologies.

4.4. POST Technologies and Operator Liabilities for the Fault Clearance

If the Operator's Fault Report received by POST Technologies is valid and contains the minimum information requested, POST Technologies will issue an Incident Ticket Opening notification and start the fault localisation and fault clearance process during normal Business Hours. Upon detection of a fault on the Broadband Service, POST Technologies will use all reasonable endeavours to repair the fault as soon as reasonably practicable.

Fault clearance shall be terminated by the end of the Business Day following the Incident Ticket Opening except where the restoration of the Broadband Service requires works of such importance that they need substantial works to be carried out (e.g. civil works) or that an appointment has to be made with the End User for an on-site intervention. The applicable tariffs are specified in Schedule 6.

The Operator shall cooperate with POST Technologies' reasonable requests in an effort to locate and, if possible, resolve any fault. POST Technologies reserves the right to contact and make an appointment with the Operator's End User for the restoration of the Broadband Service.

In case contact with the End User is necessary for fault location and/or restoration, POST Technologies reserves the right to contact and make an appointment with the Operator's End User for the restoration of the Broadband Service, unless the Operator has not indicated an End User contact point in its Fault report. In this case POST Technologies will contact the Operator in order to fix an appointment at the End User's premises for further investigation and fault resolution. The time elapsed between the contact with the Operator and the scheduling of an appointment will not be considered for the fault repair time computation.

When POST Technologies believes that the fault has been cleared and the Broadband Service is reestablished, an Incident Ticket Closing notification will be sent to the Operator. Unless the Operator rejects the concerned Incident Ticket Closing within twenty-four (24) hours after its receipt, the Incident Ticket and the related Fault Report will be closed automatically by POST Technologies.

If the Operator rejects the Incident Ticket Closing as specified above, it shall specifically provide the following information:

- (i) The reason why the Operator reasonably believes that the circuit is unsuitable for use of the Broadband service.
- (ii) All additional information that the Operator reasonably considers suitable to assist in understanding and diagnosing any underlying fault in the Broadband Service.

The Operator shall cooperate with POST Technologies to carry out further tests, even on Operator's equipment when reasonably requested to do so. At its sole discretion, POST Technologies may carry out additional works upon the Operator's request, while the costs thereof shall be invoiced to the Operator.

Both Parties recognise and acknowledge that the fault repair time will commence when POST Technologies issues the Incident Ticket Opening and will end when POST Technologies issues the Incident Ticket Closing.

4.5. Wrongful Repair Request

A wrongful Fault Report occurs when POST Technologies has done all necessary measurements and test results prove that the quality of the Broadband Services mentioned in the Fault Report or its underlying circuit is not the cause of the service interruption or service degradation.

In case of a repair where the detected fault lies outside the scope of POST Technologies' responsibility under this ROB or in case of a wrongful Fault Report, all costs related to works and travelling already performed by POST Technologies in relation to such Fault Report will be charged to the Operator.

4.6. End User's Liabilities

The Operator shall ensure that the End User(s) will timely grant POST Technologies' field technicians access to the demarcation point and/or network termination points within his/her premises as often as required for an efficient service restoration. In case POST Technologies cannot access the premises, POST Technologies will report this to the Operator, who will have to contact forthwith the End User and take the necessary arrangements to grant access to POST Technologies.

In case of the End User's absence at the agreed time of the appointment, POST Technologies' field technician will use the contact information (phone number) provided by the Operator to get in touch with the End User while still on site. If the field technician cannot reach the End User, he/she will alert the Operator who may have additional means to contact the End User.

In case no access to the premises is granted by the End User or any other person entitled to do so after a maximum waiting time of 15 minutes after the initial appointment, POST Technologies' technician will leave the site and place a message in the End User's mailbox requesting him/her to contact POST Technologies' helpdesk to make a new appointment.

Schedule 5 Service Level Agreement

5.1. Service Level for Broadband Service Provisioning

POST Technologies will make every effort to realise ninety-five percent (95%) of all activation requests received for Broadband Services by one Operator on the due date demanded by said Operator. If POST Technologies fails to provide the above-mentioned Broadband Service in compliance with Schedule 3, the Operator will be granted a financial indemnity equivalent to one monthly fee for the Broadband Service concerned, while should this delay fall beyond fifteen (15) calendar days, the said indemnity will be increased to be equivalent to two monthly fees for the Broadband Services concerned.

No financial indemnity will be granted for delays in provisioning the Broadband Service in case:

- (i) of a Force Majeure event;
- (ii) the Operator fails to claim the above-mentioned financial indemnity within thirty (30) calendar days as from the day after which the warranted provisioning time has elapsed; or
- (iii) POST Technologies has been prevented in whole or in part to intervene in due time to comply with the warranted provisioning time, notably due to the Operator's and/or the End User's act or omission.

The Operator can opt for priority handling by purchasing a "Rush Order" for each Broadband Service concerned by means of an additional fee as set out in Schedule 6 and according to the procedures as described in paragraphs 3.3.8.2 and 3.4.3.2, if time slots are available at the time of ordering.

5.1.1. Standard Service Level for Broadband Service Restoration

POST Technologies will attempt to reestablish Broadband Services before the end of the first (1) Business Day following the day at which a valid Fault Report has been submitted, except where the required clearance works are of such importance that they need substantial works to be carried out (e.g. civil works) or that an appointment with the End User has to be made.

If POST Technologies fails to achieve service restoration within the above-mentioned time period for less than 95% of one Operator's validly submitted Fault Reports while either the concerned fault and/or the restoration delay are within POST Technologies' sole responsibility, the Operator will be granted upon written express request with a financial indemnity equivalent to one monthly fee of the Broadband Services concerned.

In case of outages at RHD level, which affect a majority of End User's connected to the Operator's network via this RHD interconnection, POST Technologies will perform fault clearance outside of Business Hours and work together with the Operator to reestablish the RHD interconnection within the shortest time possible.

5.1.2. Enhanced Service Level for Broadband Service Restoration

Fault clearance outside POST Technologies' Business Hours and/or with priority handling is possible after a valid Fault Report has been submitted,

- (i) provided the Operator has accepted, prior to each intervention and for each relevant exceptional case, the respective one-time fees set out in Schedule 6 and duly contacted

POST Technologies at the following phone number: +352 4991 5868. In this case, the terms and conditions of the Standard Service Level shall not apply, while, according to the fault concerned, the Parties will agree upon a reasonable time schedule applicable to such fault clearance. Interventions will be invoiced according to the tariffs set out in Schedule 6;

- (ii) in case the Operator has opted, by means of paying an additional monthly fee as set out in Schedule 6, for the Business or Premium Service Level option, either at the time of the initial Broadband Service order or at least one month prior to sending the Fault Report.

Fault clearance will be performed 24 hours a day, 7 days a week, for each Broadband Service covered by the Business or Premium SLA Agreement. Interventions will be invoiced according to the tariffs set out in Schedule 6.

The following table summarises the available Service Level options and their characteristics.

Service Level	Standard	Business	Premium
Eligible Service	Bitstream Service EtherConnect Service	Bitstream Service EtherConnect Service	Only for EtherConnect Services bundled with an EtherConnect Backup Service
Additional subscription fee	No	Yes	Yes
Coverage *)	8/5 (Business Hours) **)	24/7 (incl. public holidays)	24/7 (incl. public holidays)
Extended coverage	Optional (one-time fee per incident)	n/a	n/a
Intervention time	8 Business Hours	4,5 hours	4,5 hours
Availability ***)	99,60 %	99,80 %	99,95 % ****)

Table 27: Service Level parameters

*) Coverage: Period during which call-back, fault clearance and interventions will be performed

**) Business Hours: Business Days from 8:00 to 12:00 and from 13:00 to 17:00

***) Not including planned works/maintenance

****) Service is considered available if one of the two EtherConnect Services (primary or backup) is still operational

The following penalties will apply and be granted to the Operator in the form of a credit note in case the Service Level is not met. Availability, intervention time and penalties will be calculated for each Broadband Service individually.

Service Level	Business	Premium
Availability calculation period	Quarterly	Yearly
Availability	≥ 99,60 and < 99,80 %	≥ 99,90 and < 99,95 %
Penalty	6 % of quarterly fee	6 % of yearly fee
Availability	≥ 99,40 and < 99,60 %	≥ 99,85 and < 99,90 %
Penalty	12 % of quarterly fee	12 % of yearly fee
Availability	≥ 99,20 and < 99,40 %	≥ 99,80 and < 99,85 %
Penalty	18 % of quarterly fee	18 % of yearly fee
Availability	≥ 99,00 and < 99,20 %	≥ 99,75 and < 99,80 %
Penalty	24 % of quarterly fee	24 % of yearly fee
Availability	< 99,00 %	< 99,75 %
Penalty	30 % of quarterly fee	30 % of yearly fee

Table 28: Penalties in case of unavailability for Enhanced Service Levels

Service Level	Business	Premium
Intervention time (IT)	4,5 hours <IT≤ 8 hours	4,5 hours <IT≤ 8 hours
Penalty	1 monthly fee	1 monthly fee
Intervention time (IT)	> 8 hours	> 8 hours
Penalty	2 monthly fees	2 monthly fees

Table 29: Penalties in case of delayed intervention time for Enhanced Service Levels

The above provision shall not apply in case:

- (i) of a Force Majeure event;
- (ii) the Operator fails to claim the above-mentioned financial indemnity within thirty (30) calendar days as from the day after which the warranted intervention time has elapsed or thirty (30) days after the beginning of a new quarter or calendar year for indemnities related to the quarterly or yearly availability; or
- (iii) POST Technologies has been prevented in whole or in part to intervene in due time to comply with the warranted intervention time, notably due to the Operator's and/or the End User's act or omission.

Schedule 6 Tariffs

6.1. Bitstream Services

6.1.1. One-Off Fees for Bitstream Services

6.1.1.1. Access and Connectivity : One-off Fees for Bitstream Services

Item	One-off fee (EUR excl. VAT)
Installation charges (incl. activation) for a new Bitstream Service requiring intervention at the End user's site	118,79
Installation charges (incl. activation) for a new Bitstream Service only requiring intervention at POP/street level (no intervention at End User site) – also applicable to "One Technician" installations	75,09
Activation of a new Bitstream Service (remote activation, no interventions at End User site or POP/street level required)	10,79
Charges for moving a Bitstream Service to a new address	Same as standard Bitstream installation/activation
Migration of a Bitstream Service from a Donor to a Recipient Operator (without modification of infrastructure or Service Profile, remote activation only)	16,91
Cancellation of an order before activation	16,21
Conversion of a RDSLO (VDSL) or ORATH (GPON) service into a Bitstream Service	Same as standard Bitstream installation/activation
Conversion of a RDSLO (ADSL) service into a Bitstream Service requiring intervention at POP/street level and, if requested or required, at End User's site – also applicable to "One Technician" installations	75,09
Modifications of an existing Bitstream Service (e.g. modification of Bitstream Service Profile (upgrade/downgrade), move from xDSL to GPON, etc.)	Same as standard Bitstream installation/activation
Compatibility test of Operator's Equipment (CPE/HAG) on POST Technologies' test platform (in case of alterations of POST Technologies' network, the first four hours of re-evaluation of already tested equipment are free of charge)	156,90 / hour plus labour costs

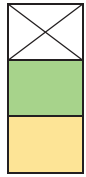
For a complete overview about the possible modifications and whether they require on-site interventions (either by POST Technologies' or the Operator's technicians), please refer to the following Table 30: Authorised change requests.

The following table gives an overview about all the authorised modifications for Bitstream service profiles.

Matrix for Bitstream service profile modifications		New Bitstream service profile after modification												
		Flex 20	Flex 20	Flex 20	Flex 20	Flex 100	Flex 100	Flex 100	Flex 100	Flex 300	Flex 300	Flex 500	Flex 500	Flex 1000
		ADSL	VDSL	G.fast	GPON	VDSL	VDSL Bonding	G.fast	GPON	G.fast	GPON	G.fast	GPON	GPON
Bitstream service profile before modification	Fix 20 ADSL	Green	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 20 VDSL	White	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 20 G.fast	White	White	Green	Yellow	White	White	Green	Yellow	Green	Yellow	Green	Yellow	Yellow
	Fix 20 GPON	White	White	White	Green	White	White	White	Green	White	Green	White	Green	Green
	Fix 30 VDSL	White	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 30 G.fast	White	White	Green	Yellow	White	White	Green	Yellow	Green	Yellow	Green	Yellow	Yellow
	Fix 30 GPON	White	White	White	Green	White	White	White	Green	White	Green	White	Green	Green
	Fix 100 VDSL	White	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 100 VDSL Bonding	White	Yellow	Yellow	Yellow	White	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 100 G.fast	White	White	Green	Yellow	White	White	Green	Yellow	Green	Yellow	Green	Yellow	Yellow
	Fix 100 GPON	White	White	White	Green	White	White	White	Green	White	Green	White	Green	Green
	Fix 200 G.fast	White	White	Green	Yellow	White	White	Green	Yellow	Green	Yellow	Green	Yellow	Yellow
	Fix 200 GPON	White	White	White	Green	White	White	White	Green	White	Green	White	Green	Green
	Flex 20 ADSL	White	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 20 VDSL	White	White	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 20 G.fast	White	White	White	Yellow	White	White	Green	Yellow	Green	Yellow	Green	Yellow	Yellow
	Flex 20 GPON	White	White	White	White	White	White	White	Green	White	Green	White	Green	Green
	Flex 100 VDSL	White	Green	Yellow	Yellow	White	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 100 VDSL Bonding	White	Yellow	Yellow	Yellow	White	White	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 100 G.fast	White	White	Green	Yellow	White	White	Yellow	Green	Yellow	Green	Yellow	Green	Yellow
	Flex 100 GPON	White	White	White	Green	White	White	White	White	White	Green	White	Green	Green
	Flex 300 G.fast	White	White	Green	Yellow	White	White	Green	Yellow	White	Yellow	Green	Yellow	Yellow
	Flex 300 GPON	White	White	White	Green	White	White	White	Green	White	White	White	Green	Green
	Flex 500 G.fast	White	White	Green	Yellow	White	White	Green	Yellow	Green	Yellow	White	Yellow	Yellow
	Flex 500 GPON	White	White	White	Green	White	White	White	Green	White	Green	White	White	Green
	Flex 1000 GPON	White	White	White	Green	White	White	White	Green	White	Green	White	Green	White

Matrix for Bitstream service profile modifications		New Bitstream service profile after modification												
		Fix 20	Fix 20	Fix 20	Fix 20	Fix 30	Fix 30	Fix 30	Fix 100	Fix 100	Fix 100	Fix 100	Fix 200	Fix 200
		ADSL	VDSL	G.fast	GPON	VDSL	G.fast	GPON	VDSL	VDSL Bonding	G.fast	GPON	G.fast	GPON
Bitstream service profile before modification	Fix 20 ADSL	X	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	
	Fix 20 VDSL	X	X	Yellow	Yellow	Green	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	
	Fix 20 G.fast	X	X	X	Yellow	X	Green	Yellow	X	X	Green	Yellow	Green	Yellow
	Fix 20 GPON	X	X	X	X	X	Green	X	X	X	Green	X	Green	Green
	Fix 30 VDSL	X	Green	Yellow	Yellow	X	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 30 G.fast	X	X	Green	Yellow	X	X	Yellow	X	X	Green	Yellow	Green	Yellow
	Fix 30 GPON	X	X	X	Green	X	X	X	X	X	X	Green	X	Green
	Fix 100 VDSL	X	Green	Yellow	Yellow	Green	Yellow	Yellow	X	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 100 VDSL Bonding	X	Yellow	Yellow	Yellow	Yellow	Yellow	X	X	Yellow	Yellow	Yellow	Yellow	Yellow
	Fix 100 G.fast	X	X	Green	Yellow	X	Green	Yellow	X	X	X	Yellow	Green	Yellow
	Fix 100 GPON	X	X	X	Green	X	Green	X	X	X	X	X	X	Green
	Fix 200 G.fast	X	X	Green	Yellow	X	Green	Yellow	X	X	Green	Yellow	X	Yellow
	Fix 200 GPON	X	X	X	Green	X	Green	X	X	X	Green	X	X	Green
	Flex 20 ADSL	Green	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 20 VDSL	X	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 20 G.fast	X	X	Green	Yellow	X	X	Yellow	X	X	Green	Yellow	Green	Yellow
	Flex 20 GPON	X	X	X	Green	X	Green	X	X	X	Green	X	X	Green
	Flex 100 VDSL	X	Green	Yellow	Yellow	Green	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 100 VDSL Bonding	X	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
	Flex 100 G.fast	X	X	Green	Yellow	X	Green	Yellow	X	X	Green	Yellow	Green	Yellow
	Flex 100 GPON	X	X	X	Green	X	Green	X	X	X	Green	X	X	Green
	Flex 300 G.fast	X	X	Green	Yellow	X	Green	Yellow	X	X	Green	Yellow	Green	Yellow
	Flex 300 GPON	X	X	X	Green	X	Green	X	X	X	Green	X	X	Green
	Flex 500 G.fast	X	X	Green	Yellow	X	Green	Yellow	X	X	Green	Yellow	Green	Yellow
	Flex 500 GPON	X	X	X	Green	X	Green	X	X	X	Green	X	X	Green
	Flex 1000 GPON	X	X	X	Green	X	Green	X	X	X	Green	X	X	Green

Table 30: Authorised change requests



Not authorised

Remote activation

Requires on-site intervention

6.1.1.2. RHD Interconnection : One-off Fees for Bitstream Services

Item	One-off fee (EUR excl. VAT)
Centralised on-site RHD – 10Gigabit Ethernet port	1.500,-
Centralised off-site RHD – 10Gigabit Ethernet port	1.500,- plus setup of RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 40Gigabit Ethernet port	1.500,-
Centralised off-site RHD – 40Gigabit Ethernet port	1.500,- plus setup of RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 100Gigabit Ethernet port	1.500,-
Centralised off-site RHD – 100Gigabit Ethernet port	1.500,- plus setup of RHD extension to Operator's POP (on quote)
Redundant RHD setup (fall-back/load-balancing configuration)	At no additional cost if all RHD interconnections are ordered at the same time
Conversion of non-redundant into redundant RHD setup (fall-back/load-balancing configuration)	3.500,-

6.1.1.3. Multicast Option : One-off Fees for Bitstream Services

Item	One-off fee (EUR excl. VAT)
Definition and setup of Multicast configuration	13.490,55
Definition of Multicast Access Profile	4.417,72
Activation or modification per Multicast Group (Channel)	200,-
Activation of Multicast Option per Bitstream Service	15,-
Cancellation of Multicast Option per Bitstream Service	5,-

6.1.1.4. Rush Order : One-off Fees for Bitstream Services

Item	One-off fee (EUR excl. VAT)
Rush Order type 1 (within 2 Business Days)	1.000,-
Rush Order type 2 (within 5 Business Days)	750,-
Rush Order type 3 (within 10 Business Days)	500,-

6.1.1.5. Fault Repair : One-off Fees for Bitstream Services

Item	One-off fee (EUR excl. VAT)
During Business Hours (8:00 – 17:00), fault in POST Technologies' Network	Free of charge
During Business Hours (8:00 – 17:00), fault in the Operator's Network	Invoiced per hour
Priority intervention Monday to Friday 7:00 – 19:00, Saturday 8:00 – 12:00, fault in POST Technologies' or the Operator's Network	Invoiced per hour Min. 250,- EUR per intervention ^{*)}
Priority intervention Monday to Friday 19:00 – 7:00, Saturday 0:00 – 8:00 and 12:00 – 24:00, Sundays and public holidays, fault in POST Technologies' Network or the Operator's Network	Invoiced per hour Min. 500,- EUR per intervention ^{*)}

^{*)} Minimum charge will not apply if the Operator has chosen the Business Service Level for its Bitstream Service

6.1.1.6. Service Level : One-off Fees for Bitstream Services

Item	One-off fee (EUR excl. VAT)
Setup of Business Service Level agreement	2.500,-
Activation of Business Service Level per Bitstream Service	14,-

6.1.1.7. Labour Costs

The currently applicable hourly rates related to labour costs are available on POST Technologies' Website.

6.1.2. Recurring Fees for Bitstream Services

Minimum contract period for each Bitstream Service: 6 months

6.1.2.1. Access and Connectivity : Recurring Fees for Bitstream Services

Item	Monthly Fee (EUR excl. VAT)
Bitstream Service Flex 20	25,00
Bitstream Service Flex 100	30,52
Bitstream Service Flex 300	33,42
Bitstream Service Flex 500	36,33
Bitstream Service Flex 1000	42,50
Bitstream Service Fix 20	25,00
Bitstream Service Fix 30	30,52
Bitstream Service Fix 100	33,23
Bitstream Service Fix 200	36,33

6.1.2.2. RHD Interconnection : Recurring Fees for Bitstream Services

Item	Monthly Fee (EUR excl. VAT)
Centralised on-site RHD – 10Gigabit Ethernet port	250,-
Centralised off-site RHD – 10Gigabit Ethernet port	250,- plus RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 40Gigabit Ethernet port	650,-
Centralised off-site RHD – 40Gigabit Ethernet port	650,- plus RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 100Gigabit Ethernet port	950,-
Centralised off-site RHD – 100Gigabit Ethernet port	950,- plus RHD extension to Operator's POP (on quote)
EIR traffic (Excess traffic / 95 th percentile billing) at centralised RHD	1,99 / Mbps

6.1.2.3. Multicast Option : Recurring Fees for Bitstream Services

Item	Monthly Fee (EUR excl. VAT)
Fee per Multicast stream (0 – 5000 streams)	on quote
Fee per Multicast stream (5001 – 20000 streams)	on quote
Fee per Multicast stream (> 20000 streams)	on quote

As mentioned in paragraph 2.2.5.3 a tailor-made quote will be provided to the interested Operator taking into account its specific bandwidth requirements and channel portfolio.

Example :

Multicast Option for the implementation of an IPTV offer consisting of

- 150 SD channels (approximately 3,5 Mbps per channel)
- 25 HD channels (approximately 7,0 Mbps per channel)
- Set-top boxes equipped with PVR (Personal Video Recorder) facilities (Hard Disk)

Monthly fees :

- Fee per Multicast Stream SD/HD/PVR (0-5000 streams) 2,70 EUR
- Fee per Multicast Stream SD/HD/PVR (5001-20000 streams) 2,00 EUR
- Fee per Multicast Stream SD/HD/PVR (> 20000 streams) 1,50 EUR

The pricing per Multicast Stream is based on statistical usage data for SD, HD and PVR streams.

6.1.2.4. Service Level : Recurring Fees for Bitstream Services

Item	Monthly Fee (EUR excl. VAT)
Business Service Level per Bitstream Service	14,-

6.2. EtherConnect Services

6.2.1. One-off Fees for EtherConnect Services

6.2.1.1. Connectivity : One-off Fees for EtherConnect Services

Item	One-off fee (EUR excl. VAT)
Installation fee for EtherConnect Service on existing infrastructures	669,14
EtherConnect Backup Service	same as primary EtherConnect Service of the same bandwidth
Change of EtherConnect Service Profile	202,24
Charges for moving an EtherConnect Service to a new address	same as new installation
Cancellation of an order more than a week before due activation date	200,-
Cancellation of an order less than a week before due activation date	500,-
No-show at scheduled installation date	203,17
Non-standard installation on existing infrastructure	on quote
Realisation of new fibre infrastructure (e.g. new building connection)	on quote
Feasibility check for EtherConnect Service	9,65 *)
Request for quote for non-standard installation or new infrastructure (building entry/access and/or in-house (FO-)NTP)	154,34 *)
Site survey (if required for a quote for non-standard installation or new infrastructure)	164,58
Activation of Failover Option for new EtherConnect Service	Free of charge
Activation of Failover Option for existing EtherConnect Service	350,-

*) fee will be credited if followed by an order for the proposed installations

6.2.1.2. RHD Interconnection : One-off Fees for EtherConnect Services

Item	One-off fee (EUR excl. VAT)
Centralised on-site RHD – 10Gigabit Ethernet port	1.500,-
Centralised off-site RHD – 10Gigabit Ethernet port	1.500,- plus setup of RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 40Gigabit Ethernet port	1.500,-
Centralised off-site RHD – 40Gigabit Ethernet port	1.500,- plus setup of RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 100Gigabit Ethernet port	1.500,-
Centralised off-site RHD – 100Gigabit Ethernet port	1.500,- plus setup of RHD extension to Operator's POP (on quote)

6.2.1.3. Rush Order : One-off Fees for EtherConnect Services

Item	One-off fee (EUR excl. VAT)
Rush Order type 1 (within 2 - 5 Business Days)	2.000,-
Rush Order type 2 (within 6 – 10 Business Days)	1.500,-
Rush Order type 3 (within 11 - 15 Business Days)	1.000,-

6.2.1.4. Fault Repair : One-off Fees for EtherConnect Services

Item	One-off fee (EUR excl. VAT)
During Business Hours (8:00 – 17:00), fault in POST Technologies' Network	Free of charge
During Business Hours (8:00 – 17:00), fault in the Operator's Network	Invoiced per hour
Priority intervention Monday to Friday 7:00 – 19:00, Saturday 8:00 – 12:00, fault in POST Technologies' or the Operator's Network	Invoiced per hour Min. 250,- EUR per intervention ^{*)}
Priority intervention Monday to Friday 19:00 – 7:00, Saturday 0:00 – 8:00 and 12:00 – 24:00, Sundays and public holidays, fault in POST Technologies' Network or the Operator's Network	Invoiced per hour Min. 500,- EUR per intervention ^{*)}

^{*)} Minimum charge will not apply if the Operator has chosen the Business or Premium Service Level for its EtherConnect Service

6.2.1.5. Service Level : One-off Fees for EtherConnect Services

Item	One-off fee (EUR excl. VAT)
Activation of Business or Premium Service level	Free of charge

6.2.1.6. Labour Costs

The currently applicable hourly rates related to labour costs are available on POST Technologies' Website.

6.2.2. Recurring Fees for EtherConnect Services

Minimum contract period for each EtherConnect Service: 6 months

6.2.2.1. Connectivity : Recurring Fees for EtherConnect Services

Item	Monthly Fee (EUR excl. VAT) *)
Monthly fee for EtherConnect Services:	
EtherConnect EC 2	120,-
EtherConnect EC 5	135,-
EtherConnect EC 10	150,-
EtherConnect EC 30	175,-
EtherConnect EC 50	195,-
EtherConnect EC 100	235,-
EtherConnect EC 200	305,-
EtherConnect EC 500	450,-
EtherConnect EC 1000	595,-
EtherConnect EC 2000	825,-
EtherConnect EC 5000	1.045,-
EtherConnect EC 10000	1.295,-
EtherConnect EC Backup 2-100	105,-
EtherConnect EC Backup 200-1000	170,-
EtherConnect EC Backup 2000-10000	330,-
Failover Option for EtherConnect Service	20,-

*) valid for EtherConnect Services delivered at dedicated End User sites. Tariffs for EtherConnect Services delivered at datacenters or carrier hotels which have been integrated into POST Technologies' backbone are not in scope of this reference offer.

6.2.2.2. RHD Interconnection : Recurring Fees for EtherConnect Services

Item	Monthly Fee (EUR excl. VAT)
Centralised on-site RHD – 10Gigabit Ethernet port	250,-
Centralised off-site RHD – 10Gigabit Ethernet port	250,- plus RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 40Gigabit Ethernet port	650,-
Centralised off-site RHD – 40Gigabit Ethernet port	650,- plus RHD extension to Operator's POP (on quote)
Centralised on-site RHD – 100Gigabit Ethernet port	950,-
Centralised off-site RHD – 100Gigabit Ethernet port	950,- plus RHD extension to Operator's POP (on quote)
EIR traffic (Excess traffic / 95 th percentile billing) at centralised RHD	1,99 / Mbps

6.2.2.3. Service Level : Recurring Fees for EtherConnect Services

Item	Monthly fee (EUR excl. VAT)
Business or Premium Service Level per EtherConnect Service EC 2 – EC 1000	39,-
Business or Premium Service Level per EtherConnect Service EC 2000 – EC 10000	79,-
Business or Premium Service Level on an EtherConnect Backup Service	Same as primary EC *)

*) EtherConnect Backup Service must be purchased with the same Service Level as associated primary EtherConnect Service

Annex 1

Specifications for products as found in the previously available RDSLO Offer

This annex features an abridged version of the basic technical and financial specifications for the formerly available products and services of the RDSLO (Reference DSL Offer).

Support for existing services will be provided according to the terms and conditions laid down for Bitstream Services in Schedule 4 - Fault Repair and Reporting and Schedule 5 - Service Level Agreement of the ROB.





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1. Service Description - Connect IP

The Connect IP Service allows the Operator to connect to EPT's DSL Network. Therefore, an IP interconnection is established with the EPT's platform aggregating the DSL Access lines. Within the scope of the RDSLO two scenarios are possible depending which xDSL service is used.

1.1. Transport of HSI traffic for standard, professional and VDSL services

1.1.1. Description

Connect IP Service uses L2TP tunnelling between EPT's BRAS and the Operator's tunnelling termination equipment. The tunnels are initiated by EPT's BRAS(s), which ensure(s) the LAC (L2TP Access Concentrator) function. The equipment(s) of the Operator are terminating the tunnels and ensure as such the function of the LNS (L2TP Network Server).

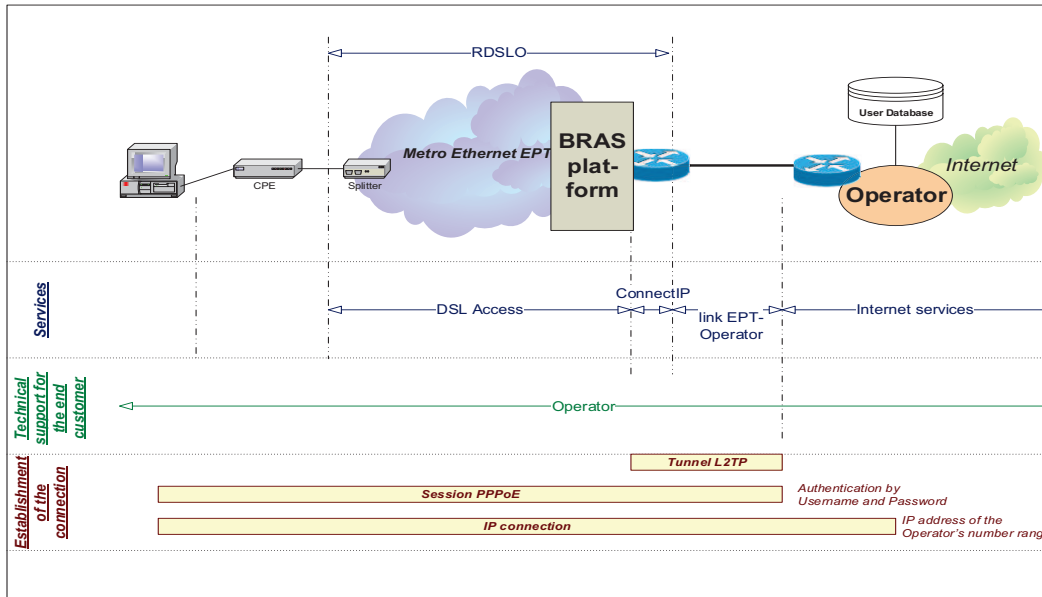
The Connect IP Service offered by EPT covers the Ethernet interface on EPT's BRAS, as well as the routing of the traffic of the Operator's End Users from the BRAS to the said interface (POI).

All Operators' DSL access lines can be reached via one single Connect IP service. This is independent from the number of BRAS(s) used by EPT within its DSL Network. The necessary routing between the different BRAS(s) lies under EPT's responsibility.

The following bandwidths are available:

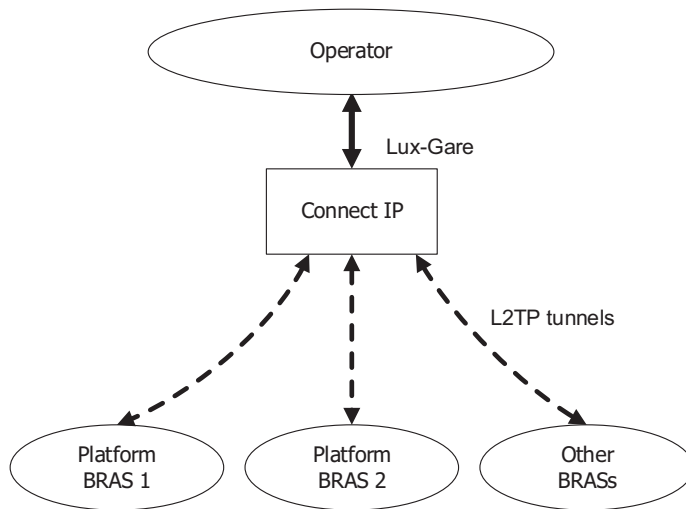
Total bandwidth of the Connect IP Service	Interface
100 Mbit/s	FastEthernet
200 Mbit/s	GbitEthernet
400 Mbit/s	GbitEthernet
700 Mbit/s	GbitEthernet
1 Gbit/s	GbitEthernet

1.1.2. Overview



1.1.3. Connect IP tunnels

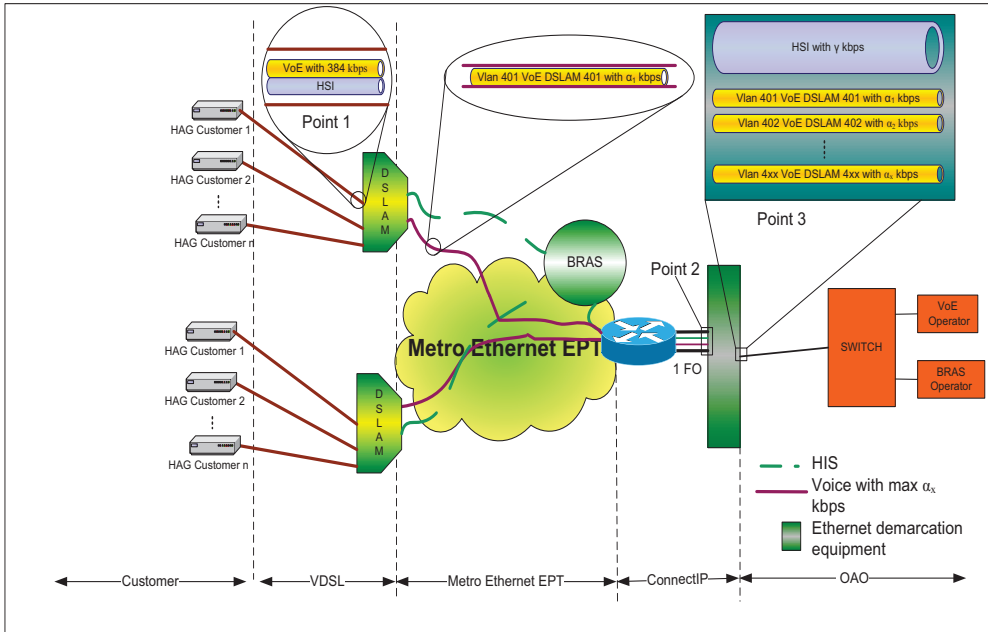
The Connect IP Service offer includes an unprotected Ethernet access to EPT’s BRAS situated at its central exchange at Luxembourg-Gare on a Fast Ethernet or Gigabit Ethernet interface. The necessary IP-addresses used to establish the IP connectivity between End User’s Active Equipment and the Operator’s tunnelling terminating equipment are provided and owned by the Operator. Via the said Connect IP access, a L2TP tunnel is established via an internal EPT trunking from each EPT’s BRAS to the Operator.



1.2. Transport of Voice Traffic for VDSL services

For VDSL lines, additional VLANs with Voice quality as described below are provided.

1.2.1. Description



The VLANs designated for VoE services, with a higher priority, are for the exclusive use of VoE protocols. For each DSLAM one VLAN is available (Point 1 to Point 2). The identification of each VLAN is done by the S-TAG, the C-TAG is for identification of the service, in this case VoE. For a VLAN between the ConnectIP demarcation point and each DSLAM a bandwidth of 3 Mbit/s is offered by default. Packets exceeding this limit will be rejected by EPT's network. However, based on justified reasons, the Operator can require additional bandwidth for those VLANs.

The overall capacity ordered at the Connect IP demarcation point (Point 3) is thus divided into two streams: (i) a VLAN for HSI traffic, (best effort quality), and (ii) one stream for VoE traffic (regrouping all VLANs VoE between the DSLAMs and the ConnectIP demarcation Point with priority bit).

With the Order fir the ConnectIP the Operator has to specify the capacity required for HSI traffic as well as the total needed traffic for VoE at Point 3.

The ordered VoE capacity may differ from the sum of all VoE-VLANs ($\sum \alpha_i$)

In case of violation of the defined service parameters for the VLANs VoE, EPT will apply policing as defined by the MEF¹. The Operator has thus to guarantee that his IP-streams fulfill the defined service parameters.

The configuration of the VLANs VoE between the ConnectIP demarcation point and the DSLAMs (Point 1 and Point 2) is as follows:

Bande passante max « Priority Bit »	Network Control (NC)	Data VoE	Signalisation VoE	Traffic "Best Effort"
3 Mbit/s	CIR: 0,15 Mbit/s CBS: 0,015 Mbyte	CIR: 2,1 Mbit/s CBS: 0,21 Mbyte	CIR: 0,15 Mbit/s EIR: 0,03 Mbit/s CBS: 0,015 Mbyte EBS: 0,003 Mbyte	EIR: 3 Mbit/s EBS: 0,3 Mbyte

¹ http://www.metroethernetforum.org/MSWord_Documents/MEF10.2.doc (last access 1.2.2010)

The configuration of the VoE stream at the ConnectIP demarcation point (Point 3) is as follows:

Bande passante max	Network Control (NC)		Data VoE		Signalisation VoE				Trafic "Best Effort"
« Priority Bit »	6		7		5				0
3 Mbit/s	CIR: 0,15 Mbit/s CBS: 0,015 Mbyte		CIR: 2,1 Mbit/s CBS: 0,21 Mbyte		CIR: 0,15 Mbit/s CBS: 0,015 Mbyte	EIR: 0,03 Mbit/s EBS: 0,003 Mbyte		EIR: 3 Mbit/s EBS: 0,3 Mbyte	
4 Mbit/s	CIR: 0,2 Mbit/s CBS: 0,02 Mbyte		CIR: 2,8 Mbit/s CBS: 0,28 Mbyte		CIR: 0,2 Mbit/s CBS: 0,02 Mbyte	EIR: 0,04 Mbit/s EBS: 0,004 Mbyte		EIR: 4 Mbit/s EBS: 0,4 Mbyte	
5 Mbit/s	CIR: 0,25 Mbit/s CBS: 0,025 Mbyte		CIR: 3,5 Mbit/s CBS: 0,35 Mbyte		CIR: 0,25 Mbit/s CBS: 0,025 Mbyte	EIR: 0,05 Mbit/s EBS: 0,005 Mbyte		EIR: 5 Mbit/s EBS: 0,5 Mbyte	
7 Mbit/s	CIR: 0,35 Mbit/s CBS: 0,035 Mbyte		CIR: 4,9 Mbit/s CBS: 0,49 Mbyte		CIR: 0,35 Mbit/s CBS: 0,035 Mbyte	EIR: 0,07 Mbit/s EBS: 0,007 Mbyte		EIR: 7 Mbit/s EBS: 0,7 Mbyte	
10 Mbit/s	CIR: 0,5 Mbit/s CBS: 0,05 Mbyte		CIR: 7 Mbit/s CBS: 0,7 Mbyte		CIR: 0,5 Mbit/s CBS: 0,05 Mbyte	EIR: 0,1 Mbit/s EBS: 0,01 Mbyte		EIR: 10 Mbit/s EBS: 1 Mbyte	
20 Mbit/s	CIR: 1 Mbit/s CBS: 0,1 Mbyte		CIR: 14 Mbit/s CBS: 1,4 Mbyte		CIR: 1 Mbit/s CBS: 0,1 Mbyte	EIR: 0,2 Mbit/s EBS: 0,02 Mbyte		EIR: 20 Mbit/s EBS: 2 Mbyte	
30 Mbit/s	CIR: 1,5 Mbit/s CBS: 0,15 Mbyte		CIR: 21 Mbit/s CBS: 2,1 Mbyte		CIR: 1,5 Mbit/s CBS: 0,15 Mbyte	EIR: 0,3 Mbit/s EBS: 0,03 Mbyte		EIR: 30 Mbit/s EBS: 3 Mbyte	
50 Mbit/s	CIR: 2,5 Mbit/s CBS: 0,25 Mbyte		CIR: 35 Mbit/s CBS: 3,5 Mbyte		CIR: 2,5 Mbit/s CBS: 0,25 Mbyte	EIR: 0,5 Mbit/s EBS: 0,05 Mbyte		EIR: 50 Mbit/s EBS: 5 Mbyte	
70 Mbit/s	CIR: 3,5 Mbit/s CBS: 0,35 Mbyte		CIR: 49 Mbit/s CBS: 4,9 Mbyte		CIR: 3,5 Mbit/s CBS: 0,35 Mbyte	EIR: 0,7 Mbit/s EBS: 0,07 Mbyte		EIR: 70 Mbit/s EBS: 7 Mbyte	
100 Mbit/s	CIR: 5 Mbit/s CBS: 0,5 Mbyte		CIR: 70 Mbit/s CBS: 7 Mbyte		CIR: 5 Mbit/s CBS: 0,5 Mbyte	EIR: 1 Mbit/s EBS: 0,1 Mbyte		EIR: 100 Mbit/s EBS: 10 Mbyte	
200 Mbit/s	CIR: 10 Mbit/s CBS: 1 Mbyte		CIR: 140 Mbit/s CBS: 14 Mbyte		CIR: 10 Mbit/s CBS: 1 Mbyte	EIR: 2 Mbit/s EBS: 0,2 Mbyte		EIR: 200 Mbit/s EBS: 20 Mbyte	
300 Mbit/s	CIR: 15 Mbit/s CBS: 1,5 Mbyte		CIR: 210 Mbit/s CBS: 21 Mbyte		CIR: 15 Mbit/s CBS: 1,5 Mbyte	EIR: 3 Mbit/s EBS: 0,3 Mbyte		EIR: 300 Mbit/s EBS: 30 Mbyte	
500 Mbit/s	CIR: 25 Mbit/s CBS: 2,5 Mbyte		CIR: 350 Mbit/s CBS: 35 Mbyte		CIR: 25 Mbit/s CBS: 2,5 Mbyte	EIR: 5 Mbit/s EBS: 0,5 Mbyte		EIR: 500 Mbit/s EBS: 50 Mbyte	
700 Mbit/s	CIR: 35 Mbit/s CBS: 3,5 Mbyte		CIR: 490 Mbit/s CBS: 49 Mbyte		CIR: 35 Mbit/s CBS: 3,5 Mbyte	EIR: 7 Mbit/s EBS: 0,7 Mbyte		EIR: 700 Mbit/s EBS: 70 Mbyte	
1000 Mbit/s	CIR: 50 Mbit/s CBS: 5 Mbyte		CIR: 700 Mbit/s CBS: 70 Mbyte		CIR: 50 Mbit/s CBS: 5 Mbyte	EIR: 10 Mbit/s EBS: 1 Mbyte		EIR: 1000 Mbit/s EBS: 100 Mbyte	

2. Service Description - DSL Access

2.1. Description

EPT's DSL Network supports at present 7 profiles of DSL Access, whereas 5 are primarily oriented towards the residential market (DSL Standard Services and VDSL services) and 2 to the professional market (DSL Professional Services), notwithstanding that they can be used by the Operator for any End User segment.

The characteristics of the different profiles of the DSL Standard Services, the VDSL services and the DSL Professional Services respectively are specified below. The minimum and maximum bandwidth figures specified below shall be understood as bandwidths on xDSL transmission protocol level. The end-to-end bandwidth including the Internet is in no case guaranteed, as the overall performance also depends on the Operator's infrastructure and aggregation links, his Internet Transit Links and the resources of the Internet (server resources, connectivity, number of connections, delay) as available at a given moment.

2.2. Standard DSL Services

Available profiles :

Standard DSL Services profile		Residential Light	Residential Medium	Residential Large
Downstream ²	- minimum:	1 Mbit/s	3 Mbit/s	5 Mbit/s
	- maximum:	8 Mbit/s	12 Mbit/s	20 Mbit/s
Upstream ³	- maximum:	512 kbit/s	640 kbit/s	768 kbit/s

In case of DSL Standard Services, the maximum upstream and downstream capacities of the DSL Access lines are not guaranteed, while the effective bandwidth in any given situation depends, amongst other reasons, on the distance between the installation address of the End User and EPT's central exchange, as well as the internal installations (cabling, equipment) in the relevant End User's premises.

The above-indicated minimum bandwidths represent the bottom level under which EPT shall accept a Fault Report issued by the Operator for lack of synchronisation speed. In case the minimum capacity of a higher profile cannot be met for a specific DSL Access, a lower profile shall be chosen by the Operator for proposition to the End User.

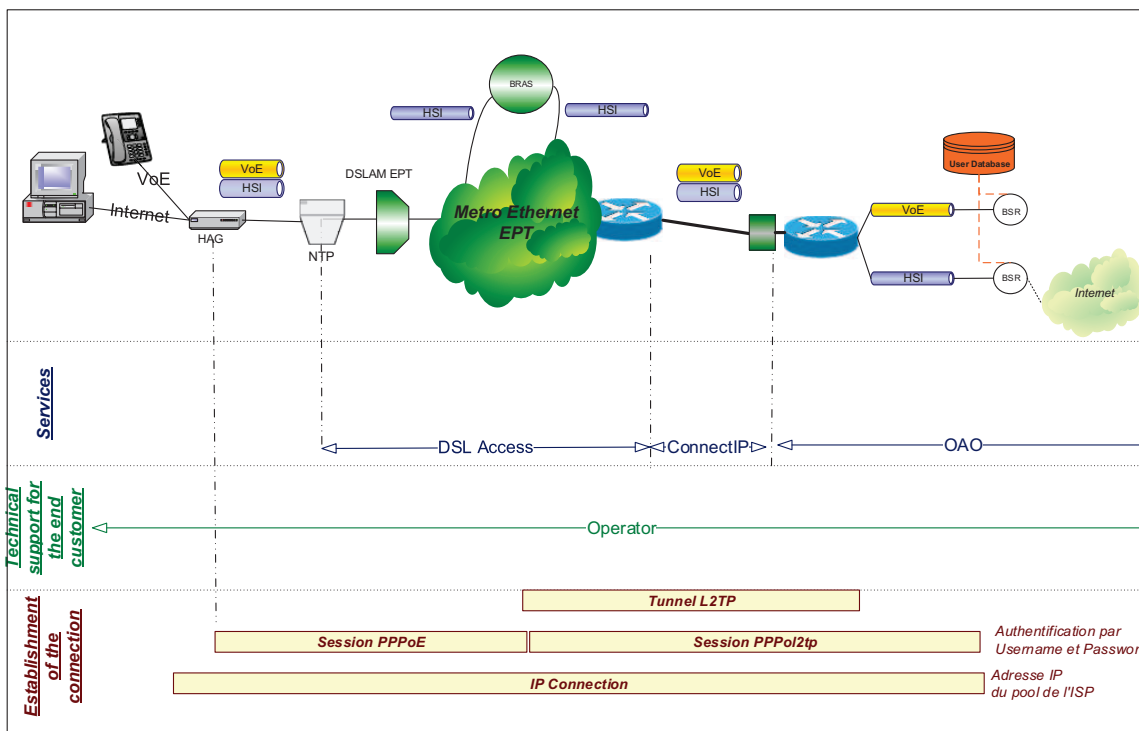
The DSL profiles related to DSL Standard Services are provided with Best Effort service quality. They are only provided on DSL Access lines where a PSTN service provided by EPT already exists. PSTN services can be provided by EPT's retail entity to the End User, or as WLR/RLO service provided by EPT to the Operator for the concerned telephony access line.

² downstream = transmission from the server to the End User.

³ upstream = transmission from the End User to the server.

2.3. VDSL services

2.3.1. Service description



VDSL Services profile:	30		100	
	Minimum ⁴	Maximum	Minimum ⁵	Maximum
Downstream	7 Mbit/s	30 Mbit/s	30 Mbit/s	100 Mbit/s
Upstream	1 Mbit/s	10 Mbit/s	2 Mbit/s	50 Mbit/s
VLAN VoE	See table below	384 kbit/s	See table below	384 kbit/s

For each VDSL access, one VLAN for VoE services is available. This VLAN has a capacity of max. 384 kbit/s included in the overall available bandwidth of the access, it is for the exclusive use of VoE protocols. Per access only one MAC address is accepted by EPT's Metro Ethernet network. No PSTN line is required to activate this service, however to minimize any interferences with the signal on the line, the installation of a central splitter by the operator is mandatory.

In case of violation of the defined service parameters for the VLANs VoE, EPT will apply policing as defined by the MEF⁶. The Operator has thus to guarantee that his IP-streams fulfill the defined service parameters.

⁴ This minimum value is a limit for broadband on the access infrastructure (before the backbone).

⁵ This minimum value is a limit for broadband on the access infrastructure (before the backbone).

⁶ http://www.metroethernetforum.org/MSWord_Documents/MEF10.2.doc (last access 1.2.2010)

The configuration of the VLAN VoE is as follows:

	Bandwidth	« Priority Bit »	Quality
Network Control (NC)	5%	6	CIR 19,2 kbit/s, CBS 1,92 kbyte, EIR 0 kbit/s
Data VoE	70%	7	CIR 268 kbit/s, CBS 26,8 kbyte, EIR 0 kbit/s
Signalisation VoE	25%	5	CIR 19,2 kbit/s, CBS 1,92 kbyte, EIR 76,8 kbit/s, EBS 7,68 kbyte
Traffic "Best Effort"	0-100%	0	CIR 0 kbit/s, CBS 0 kbyte, EIR 384 kbit/s EBS 38,4 kbyte

2.3.2. Technical details

The CPE which the Operator intends to use must be compliant with EPT's DSL network. CPEs must be compatible with the specification ITU G.993.2.

The Operator can perform a compatibility test with his equipment on EPT's DSL network; prices are as defined in chapter 4. EPT's contact point for this test is cpe.test.oao.technologies@post.lu.

For the VDSL 100 profile, EPT will use in most cases pair bonding technology, ITU-T G.998.2. For this access lines a CPE compatible with the above mentioned specification is mandatory.

If the operator wants a standard Ethernet interface at the customer's premises, EPT may offer upon request a 2-box solution where EPT will place a xDSL Modem offering to the Operator a standard Ethernet interface (100BASE-TX or 1000BASE-T).

2.4. Professional DSL Services

Professional DSL Services profile	Professional 1		Professional 2	
	Minimum	Maximum	Minimum	Maximum
Downstream	5 Mbit/s	20 Mbit/s	5 Mbit/s	20 Mbit/s
Upstream	512 kbit/s	1 Mbit/s	1 Mbit/s	2,5 Mbit/s

The costs related to the corresponding PSTN service are already included in the applicable DSL Access fees for any DSL Professional Service.

The DSL Professional Services profiles are provided with Committed Bitrate service quality.

The DSL Professional Services profiles require an extended feasibility check and additional measurements after installation.

As a consequence, the following services are not available:

- the Do-It-Yourself Installation Kit;
- feasibility check using the Internet tool; and
- a guarantee as to the standard activation lead time.

With the first provisioning of DSL Professional Services, the Operator shall install a dedicated tunnel reserved exclusively for the DSL Professional Services between the Operator's tunnelling termination equipment and EPT's BRAS. This dedicated tunnel shall only be used for traffic with DSL professional service quality. For the avoidance of doubt, EPT is duly entitled to (i) control the effective usage made of the said dedicated tunnel and to (ii) block the traffic if it is used for the transmission of normal traffic with service quality applicable to DSL Standard Services.

2.5. End User authentication and session management

The End User's username and password shall be created and managed by the Operator itself under its own responsibility and in the boundaries of the below specifications and requirements.

The Operator can define up to three (3) domain names (e.g. @operator1.lu) which shall be used by the Operator's End Users for the establishment of any and all L2TP sessions. The Operator shall duly and properly inform its End Users thereof.

This domain names allows EPT to direct the sessions to the concerned Operator. At least one (1) domain name has to be determined by the Operator before the implementation of the L2TP tunnel. The activation of the first domain name is included in the Connect IP tariff set forth in chapter 4, while the activation fee for any supplementary domain name(s), "realms", specified in said chapter 4, shall apply.

The connection between the concerned End User's access equipment and the Operator's tunnelling termination equipment is done via the protocol PPPoE⁷. The DSL Network foresees the establishment of one session PPPoE per DSL Access and by username, it being specified that legacy PPPoA⁸ is still supported.

⁷ PPPoE = Point to Point Protocol over Ethernet.

⁸ PPPoA = Point to Point Protocol over ATM.

In the End User's access equipment, a PPPoE (or PPPoA, as PPPoA is also supported for legacy services) session shall be established towards one of EPT's BRAS. Therefore, the End User shall use the authentication under the following format:

UserName@domain (e.g. UserName@Operator1.lu)

For the sake of clarity, a different specific domain name has to be defined by the Operator for the routing of Professional DSL Services.

The BRAS recognizes via the extension @domain that the concerned PPP session needs to be directed to the concerned Operator, while the said PPP session has to be terminated on an Operator's tunnelling termination equipment.

End User's authentication, IP address allocation as well as the account management are and shall remain under the Operator's sole liability.

It is explicitly specified that EPT doesn't and shall not proceed with any correspondence verification between (i) the DSL Access and (ii) the End User's username nor the Operator's domain name. As a consequence, any username created by the Operator is and shall be technically available on each DSL Access of the DSL Network, even those which the Operator has not subscribed to.

By opting for the DSL Services, the Operator expressly (i) accepts this technical constraint and (ii) shall be entitled, to prevent any abuse, to deactivate any username where the DSL Access is no more used or rented by the Operator. In case of a Migration, the Receiving Operator shall timely change or shall at least instruct its concerned End User(s) to timely change the existing domain name in the concerned End User's Active Equipment on the Migration due date as fixed between the Parties.

3. Technical specifications for End User access equipment

3.1. Active Equipment

The Active Equipment designates the equipment located in the End User premises and used for xDSL modulation, such as modems, routers, etc., as well as the End User's application equipment, such as e.g. Personal Computers (PC).

All Active Equipments have to be provided and properly maintained by the Operator. In order to prevent any disturbances of the DSL Network, Active Equipment have to comply at least with the minimal technical specifications applicable thereto and published by EPT on EPT's Website.

3.2. Passive Equipment

Passive Equipment is necessary to allow different services, such as DSL Services and PSTN services, to operate on the same copper network. Passive Equipment does not need any power supply.

The following two types of Passive Equipment shall be provided by EPT or the Operator :

- central splitters, mainly for ISDN lines and occasionally for POTS lines, and
- distributed micro-filters for the POTS lines, as well as related cabling.

For VDSL services a central splitter is mandatory and has to be installed by the Operator in order to guarantee the functionality of the active equipment.

It has to be noted that for the VDSL 100 profile, when used with pair bonding, two single pair centralised splitter compatible with the ITU-T G.998.2 specification has to be used.

In case of breakdown, the Operator shall duly and properly ensure that all Passive Equipment will in no case be modified.

The DSL Network technical specifications are published on EPT's Website.

4. Tariffs

All tariffs herein are specified in € VAT excluded.

4.1. Connect IP

HSI:

Total bandwidth of the HSI traffic	Interface	Installation charges	Total monthly rental charges
100 Mbit/s	FastEthernet	2814,80	277
200 Mbit/s	GbitEthernet	2814,80	554
400 Mbit/s	GbitEthernet	2814,80	1100
700 Mbit/s	GbitEthernet	2814,80	1446
1 Gbit/s	GbitEthernet	2814,80	1660

VoE traffic (using the same port as HSI traffic (without installation charges) or using a dedicated port (with installation charges)):

Total bandwidth of the VoE traffic	Interface	Installation charges*	Total monthly rental charges (per Mbit/s)
0-100 Mbit/s	FastEthernet	2814,80	8,08
101-200 Mbit/s	GbitEthernet	2814,80	7,37
201-400 Mbit/s	GbitEthernet	2814,80	5,35
401-700 Mbit/s	GbitEthernet	2814,80	3,83
701-1000 Mbit/s	GbitEthernet	2814,80	3,02

* only applicable in case a dedicated port is requested by the Operator or in case the total ordered capacity (HSI+VoE) exceeds the existing port capacity.

4.2. LuxDSL Access service – one-off charges

Item	Euro
Installation charges for DSL Standard Service	34,32
Installation charges for DSL Professional Service	192,84
Activation of an EPT's xDSL Service	10,79
Installation charges for VDSL Service	74,09
Negative Answer to a VDSL Order* or cancellation of an order before activation	14,98
Fee for moving a DSL Standard Service to a new address	34,32
Fee for moving a DSL Professional Service to a new address	192,84
Fee for moving a VDSL Service to a new address	74,09
Migration of a Standard DSL or a VDSL to the Receiving Operator	16,91
Migration of a standard or professional LUXDSL service to VDSL	74,09
Change of the profile of given standard DSL Services - upgrade or downgrade	free of charge
Provisioning of Splitter for End User site	5
Fee per activation of supplementary realm	346,30
Compatibility Test of Operator Equipment on EPT's test platform (per hour; in case of a scheduled system alteration with major impact the first four hours are for free)	156,90

* Only in case EPT's search engine showed clearly that the specific address is not yet served by EPT's VDSL network

4.3. DSL Access service – recurring charges

A minimum contract term of 6 months shall apply in all cases whichever may be the DSL Services concerned and for all profiles.

DSL Services Profile	Euro
Residential Light	14,51
Residential Medium	19,69
Residential Large	20,50
Professional 1	132,26
Professional 2	169,00
VDSL 30	30,52
VDSL 100	33,23

4.4. Fault Repair

Time of intervention, (working days, from Monday to Friday)	Origin of the fault is situated	Price
8am-5pm	On EPT's side	For free
8am-5pm	On Operator's side	Price A

4.4.1. The Operator wishes that the fault repair be done prior to another End User's request or outside working hours. In this case, the following prices are applicable:

Time of intervention	Origin of the fault is situated	Price
Priority from 7am-7pm (Monday to Friday) and 8am-12pm (Saturday)	On Operator's or on EPT's side	Price B
From 7pm-7am from Monday to Friday, Saturday from 12am on and Sunday	On Operator's or on EPT's side	Price C

4.4.2. Manpower fees

Price A = Actual EPT manpower fee - per hour plus surcharges

Price B = Actual EPT manpower fee - per hour plus surcharges with a minimum of 250 Euros per intervention

Price C = Actual EPT manpower fee - per hour plus surcharges with a minimum of 500 Euros per intervention.

For the avoidance of doubt, the prices A, B and C are not applied if a general fault takes place.

Annex 2

Specifications for products as found in the previously available ORATH offer

This annex features an abridged version of the basic technical and financial specifications for the formerly available products and services of the ORATH (Offre de Référence Accès Très Hauts Débits sur FTTH).

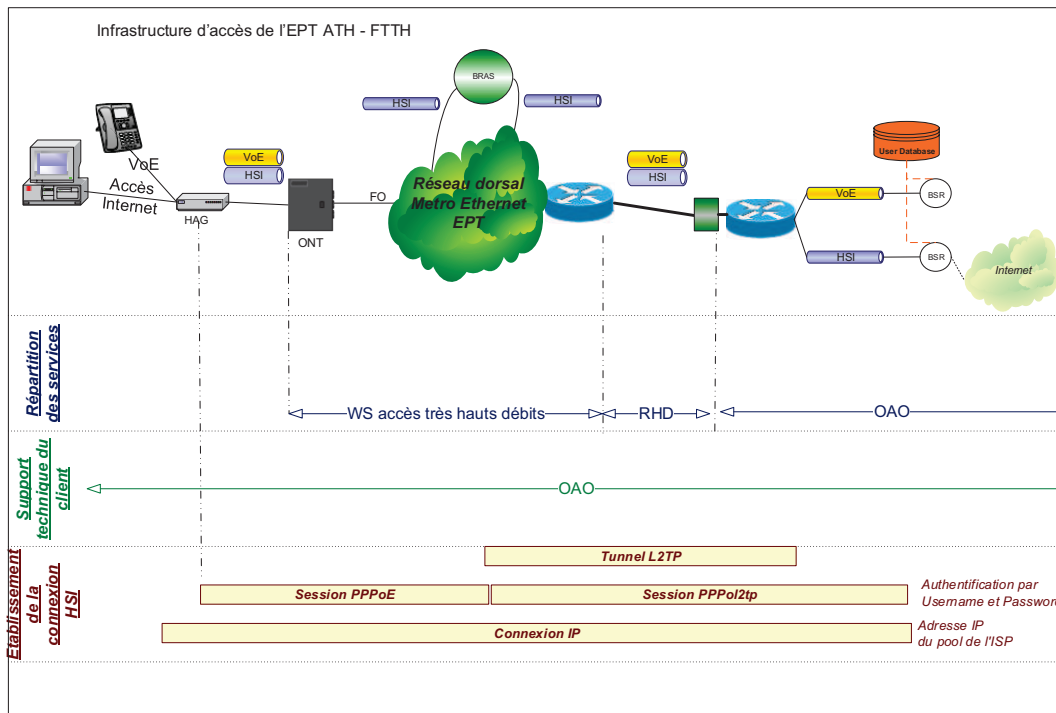
Support for existing services will be provided according to the terms and conditions laid down for Bitstream Services in Schedule 4 - Fault Repair and Reporting and Schedule 5 - Service Level Agreement of the ROB.



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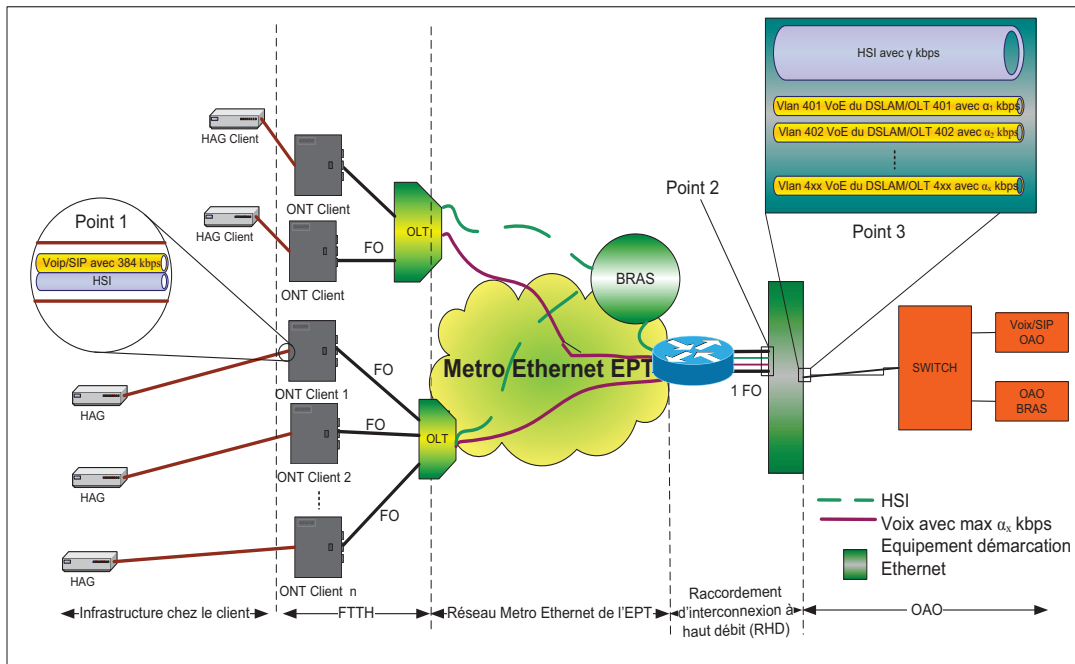
1. Schéma technique des Services ATH



2. Description et limitation de la transmission VoE

Pour le transport des signaux VoE les paramètres spécifiés ci-dessous sont à respecter :

- Point 1 : L'accès au réseau de l'EPT par client est l'équipement ONT installé chez le Client Final.
- Point 2 : Les VLAN VoE au niveau du réseau dorsal « Metro Ethernet » de l'EPT
- Point 3 : La liaison RHD entre l'Opérateur et l'EPT au niveau de l'équipement de démarcation Ethernet



Point 1 :

A travers chaque raccordement ATH un VLAN spécifique pour l'acheminement de signaux VoE est mis à disposition. Ce VLAN d'une capacité de 384 kbit/s (Ethernet) (inclus dans la capacité totale du raccordement) est limité exclusivement au transport de signaux VoE. Par raccordement ATH une seule adresse MAC est acceptée par le réseau de l'EPT.

En cas de violation des paramètres de service définis pour les VLAN VoE d'accès, le réseau de l'EPT appliquera du "Policing" selon MEF¹. L'Opérateur doit donc gérer ses flux au niveau Ethernet afin de ne pas violer les paramètres de service.

La configuration du VLAN est la suivante:

	Bande passante max	« Priority Bit »	Qualité
VoE			
Network Control (NC)	5%	6	CIR 19,2 kbit/s, CBS 1,92 kbyte, EIR 0 kbit/s
Data VoE	70%	7	CIR 268 kbit/s, CBS 26,8 kbyte, EIR 0 kbit/s
Signalisation VoE	25%	5	CIR 19,2 kbit/s, CBS 1,92 kbyte, EIR 76,8 kbit/s, EBS 7,68 kbyte
Trafic "Best Effort"	0-100%	0	CIR 0 kbit/s, CBS 0 kbyte, EIR 384 kbit/s EBS 38,4 kbyte

Point 2 :

¹ http://www.metroethernetforum.org/MSWord_Documents/MEF10.2.doc (dernier accès 1.2.2010)

Au niveau du réseau dorsal une capacité de 3 Mbit/s² pour le transport de signaux VoE est mise à disposition par Opérateur vers chaque point de concentration OLT. En cas de dépassement de cette capacité le réseau de l'EPT rejette les paquets en trop. L'Opérateur doit donc gérer ses services voix afin de ne pas dépasser la bande passante réservée pour ce type de service. En cas de besoin justifié, l'Opérateur peut demander l'augmentation de la capacité par point de concentration mise à disposition.

En cas de violation des paramètres de service définis pour les VLAN VoE d'accès, le réseau de l'EPT appliquera du "Policing" selon MEF. L'Opérateur doit donc gérer ses flux au niveau Ethernet afin de ne pas violer les paramètres de service.

Bande passante max « Priority Bit »	Network Control (NC)	Data VoE	Signalisation VoE	Trafic "Best Effort"
	6	7	5	0
3 Mbit/s	CIR: 0,15 Mbit/s CBS: 0,015 Mbyte	CIR: 2,1 Mbit/s CBS: 0,21 Mbyte	CIR: 0,15 Mbit/s EIR: 0,03 Mbit/s CBS: 0,015 Mbyte EBS: 0,003 Mbyte	EIR: 3 Mbit/s EBS: 0,3 Mbyte

Point 3 :

Au niveau de la liaison RHD du côté de l'Opérateur, l'Opérateur doit spécifier ses besoins totaux en capacité pour le trafic HSI (Best effort) et VoE. Pour le trafic VoE un VLAN par équipement de concentration OLT est offert. L'Opérateur doit veiller à ne pas dépasser ni la capacité offerte par point de concentration (initialement 3 Mbit/s) ni la capacité totale achetée pour le transport de signaux VoE au niveau du RHD. Les informations envoyées dépassant ces limites sont automatiquement rejetées par le réseau.

Les différents VLAN peuvent être définis à travers la combinaison S-TAG/C-TAG, le S-TAG identifiant l'équipement de concentration OLT, le C-TAG identifiant le service (VoE pour le cas présent).

En cas de violation des paramètres de service définis pour les VLAN VoE d'accès, le réseau de l'EPT appliquera du "Policing" selon MEF. L'Opérateur doit donc gérer ses flux au niveau Ethernet afin de ne pas violer les paramètres de service.

² ou selon besoin justifié avec les mêmes proportions pour la Bande passante max. que pour le 3 Mbit/s, voir tableau.

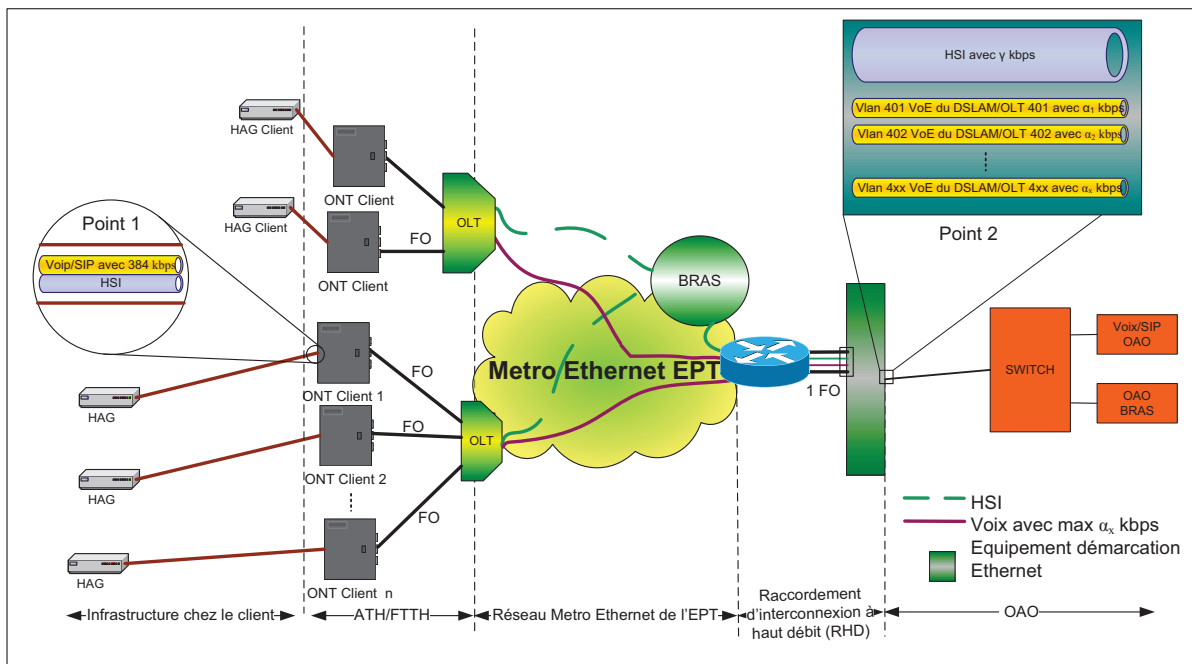
La configuration des VLAN VoE au niveau du RHD (au point 3) est la suivante :

Bande passante max « Priority Bit »	Network Control (NC)	Data VoE	Signalisation VoE	Traffic "Best Effort"
	6	7	5	0
3 Mbit/s	CIR: 0,15 Mbit/s CBS: 0,015 Mbyte	CIR: 2,1 Mbit/s CBS: 0,21 Mbyte	CIR: 0,15 Mbit/s EIR: 0,03 Mbit/s CBS: 0,015 Mbyte EBS: 0,003 Mbyte	EIR: 3 Mbit/s EBS: 0,3 Mbyte
4 Mbit/s	CIR: 0,2 Mbit/s CBS: 0,02 Mbyte	CIR: 2,8 Mbit/s CBS: 0,28 Mbyte	CIR: 0,2 Mbit/s EIR: 0,04 Mbit/s CBS: 0,02 Mbyte EBS: 0,004 Mbyte	EIR: 4 Mbit/s EBS: 0,4 Mbyte
5 Mbit/s	CIR: 0,25 Mbit/s CBS: 0,025 Mbyte	CIR: 3,5 Mbit/s CBS: 0,35 Mbyte	CIR: 0,25 Mbit/s EIR: 0,05 Mbit/s CBS: 0,025 Mbyte EBS: 0,005 Mbyte	EIR: 5 Mbit/s EBS: 0,5 Mbyte
7 Mbit/s	CIR: 0,35 Mbit/s CBS: 0,035 Mbyte	CIR: 4,9 Mbit/s CBS: 0,49 Mbyte	CIR: 0,35 Mbit/s EIR: 0,07 Mbit/s CBS: 0,035 Mbyte EBS: 0,007 Mbyte	EIR: 7 Mbit/s EBS: 0,7 Mbyte
10 Mbit/s	CIR: 0,5 Mbit/s CBS: 0,05 Mbyte	CIR: 7 Mbit/s CBS: 0,7 Mbyte	CIR: 0,5 Mbit/s EIR: 0,1 Mbit/s CBS: 0,05 Mbyte EBS: 0,01 Mbyte	EIR: 10 Mbit/s EBS: 1 Mbyte
20 Mbit/s	CIR: 1 Mbit/s CBS: 0,1 Mbyte	CIR: 14 Mbit/s CBS: 1,4 Mbyte	CIR: 1 Mbit/s EIR: 0,2 Mbit/s CBS: 0,1 Mbyte EBS: 0,02 Mbyte	EIR: 20 Mbit/s EBS: 2 Mbyte
30 Mbit/s	CIR: 1,5 Mbit/s CBS: 0,15 Mbyte	CIR: 21 Mbit/s CBS: 2,1 Mbyte	CIR: 1,5 Mbit/s EIR: 0,3 Mbit/s CBS: 0,15 Mbyte EBS: 0,03 Mbyte	EIR: 30 Mbit/s EBS: 3 Mbyte
50 Mbit/s	CIR: 2,5 Mbit/s CBS: 0,25 Mbyte	CIR: 35 Mbit/s CBS: 3,5 Mbyte	CIR: 2,5 Mbit/s EIR: 0,5 Mbit/s CBS: 0,25 Mbyte EBS: 0,05 Mbyte	EIR: 50 Mbit/s EBS: 5 Mbyte
70 Mbit/s	CIR: 3,5 Mbit/s CBS: 0,35 Mbyte	CIR: 49 Mbit/s CBS: 4,9 Mbyte	CIR: 3,5 Mbit/s EIR: 0,7 Mbit/s CBS: 0,35 Mbyte EBS: 0,07 Mbyte	EIR: 70 Mbit/s EBS: 7 Mbyte
100 Mbit/s	CIR: 5 Mbit/s CBS: 0,5 Mbyte	CIR: 70 Mbit/s CBS: 7 Mbyte	CIR: 5 Mbit/s EIR: 1 Mbit/s CBS: 0,5 Mbyte EBS: 0,1 Mbyte	EIR: 100 Mbit/s EBS: 10 Mbyte
200 Mbit/s	CIR: 10 Mbit/s CBS: 1 Mbyte	CIR: 140 Mbit/s CBS: 14 Mbyte	CIR: 10 Mbit/s EIR: 2 Mbit/s CBS: 1 Mbyte EBS: 0,2 Mbyte	EIR: 200 Mbit/s EBS: 20 Mbyte
300 Mbit/s	CIR: 15 Mbit/s CBS: 1,5 Mbyte	CIR: 210 Mbit/s CBS: 21 Mbyte	CIR: 15 Mbit/s EIR: 3 Mbit/s CBS: 1,5 Mbyte EBS: 0,3 Mbyte	EIR: 300 Mbit/s EBS: 30 Mbyte
500 Mbit/s	CIR: 25 Mbit/s CBS: 2,5 Mbyte	CIR: 350 Mbit/s CBS: 35 Mbyte	CIR: 25 Mbit/s EIR: 5 Mbit/s CBS: 2,5 Mbyte EBS: 0,5 Mbyte	EIR: 500 Mbit/s EBS: 50 Mbyte
700 Mbit/s	CIR: 35 Mbit/s CBS: 3,5 Mbyte	CIR: 490 Mbit/s CBS: 49 Mbyte	CIR: 35 Mbit/s EIR: 7 Mbit/s CBS: 3,5 Mbyte EBS: 0,7 Mbyte	EIR: 700 Mbit/s EBS: 70 Mbyte
1000 Mbit/s	CIR: 50 Mbit/s CBS: 5 Mbyte	CIR: 700 Mbit/s CBS: 70 Mbyte	CIR: 50 Mbit/s EIR: 10 Mbit/s CBS: 5 Mbyte EBS: 1 Mbyte	EIR: 1000 Mbit/s EBS: 100 Mbyte

3. Description et limitation de la transmission HSI

Pour le transport des signaux HSI, les paramètres spécifiés ci-dessous sont à respecter :

- Point 1 : L'accès au réseau de l'EPT par client est l'équipement ONT, installé chez le Client Final pour les raccordements réalisés moyennant une infrastructure FTTH.
- Point 2 : La liaison RHD entre l'Opérateur et l'EPT au niveau de l'équipement de démarcation Ethernet.



Au niveau du réseau dorsal, le VLAN pour les signaux HSI est utilisé en mode partagé par tous les Opérateurs.

Tous les flux HSI des accès ATH de l'Opérateur peuvent être acheminés via une seule liaison RHD. Ceci est indépendant du nombre de BRAS utilisés. Le routage entre les BRAS est sous la responsabilité de l'EPT.

Point 1 :

La configuration de l'accès HSI au réseau de l'EPT est la suivante :

Bande passante max		HSI					
30	Mbit/s	EIR:	30	Mbit/s	EBS:	3	Mbyte
100	Mbit/s	EIR:	100	Mbit/s	EBS:	10	Mbyte
200	Mbit/s	EIR:	200	Mbit/s	EBS:	20	Mbyte

Point 2 :

Au niveau de la liaison RHD, l'Opérateur doit spécifier ses besoins totaux en capacité pour le trafic HSI et VoE. Pour le trafic HSI un VLAN par Opérateur est offert. L'Opérateur doit veiller à ne pas dépasser la capacité totale achetée pour le transport de signaux HSI au niveau du RHD. Les informations envoyées dépassant ces limites sont automatiquement rejetées par le réseau.

La configuration du VLAN HSI au niveau du RHD est la suivante :

Bande passante max.		HSI					
30	Mbit/s	EIR:	30	Mbit/s	EBS:	3	Mbyte
50	Mbit/s	EIR:	50	Mbit/s	EBS:	5	Mbyte
100	Mbit/s	EIR:	100	Mbit/s	EBS:	10	Mbyte
200	Mbit/s	EIR:	200	Mbit/s	EBS:	20	Mbyte
300	Mbit/s	EIR:	300	Mbit/s	EBS:	30	Mbyte
500	Mbit/s	EIR:	500	Mbit/s	EBS:	50	Mbyte
700	Mbit/s	EIR:	700	Mbit/s	EBS:	70	Mbyte
1.000	Mbit/s	EIR:	1.000	Mbit/s	EBS:	100	Mbyte
2.000	Mbit/s	EIR:	2.000	Mbit/s	EBS:	200	Mbyte
3.000	Mbit/s	EIR:	3.000	Mbit/s	EBS:	300	Mbyte
5.000	Mbit/s	EIR:	5.000	Mbit/s	EBS:	500	Mbyte
10.000	Mbit/s	EIR:	10.000	Mbit/s	EBS:	1.000	Mbyte

4. Conditions commerciales et financières – RHD

4.1. Conditions commerciales

Pour connecter son réseau au réseau dorsal «Metro Ethernet» de l'EPT, un Opérateur peut commander des RHD qui sont terminés par l'EPT sur un équipement de démarcation Ethernet installé chez l'Opérateur (voir schémas aux chapitres 2 et 3). Les liaisons RHD mises à disposition par l'EPT peuvent être terminées soit dans une salle de colocation, soit dans un autre POP de l'Opérateur.

Ces RHD seront configurés pour transporter plusieurs VLAN, optimisés respectivement pour :

- l'accès HSI, offert par l'Opérateur
- le transport du trafic relatif aux services VoE offerts par l'Opérateur

Pour le dimensionnement du RHD, l'Opérateur doit indiquer la bande passante requise pour le VLAN HSI et pour l'ensemble des VLANs VoE.

Terminaison du RHD dans une salle de colocation

Le raccordement est réalisé par une paire de fibres optiques monomodes, terminée sur un équipement de démarcation de l'EPT et installée dans l'armoire de l'Opérateur dans la salle de colocation. L'interface est du type 1000BASE-LX Small Form-Factor Pluggable (SFP), 1310 nm, 10 km. Le délai de réalisation est de 4 semaines après réception d'une commande ferme. L'Opérateur doit mettre à disposition de l'EPT un branchement électrique 230V/AC. La fourniture de l'énergie et la paire de fibres optiques sont à charge de l'Opérateur.

Terminaison du RHD dans un POP de l'Opérateur

Le raccordement est prolongé dans le réseau de l'EPT jusqu'au POP de l'Opérateur. Une étude de faisabilité pour la production de ce prolongement est effectuée sous réserve de la signature préalable du Contrat ATH. Après la réalisation de cette étude de faisabilité, et si celle-ci se révèle positive, l'EPT convient d'une date prévisionnelle de mise à disposition du raccordement et s'engage à mettre à disposition le RHD dans un délai maximal de trois (3) mois après réception d'une commande ferme.

Le prix dépend de la distance entre le POP de l'Opérateur et le site d'accès au service de l'EPT. Une offre sur mesure est élaborée sur demande dans un délai de 3 semaines après réception d'une telle demande de la part de l'Opérateur.

Au cas où l'Opérateur n'a placé aucune commande ferme ou si l'étude de faisabilité est négative, le RHD sera terminé dans une salle de colocation.

4.2. Conditions financières

Les offres ci-dessous couvrent la mise à disposition d'un raccordement RHD avec une liaison GE entre l'équipement d'accès au service et l'équipement de démarcation installé dans la salle de colocation du même bâtiment dans l'armoire de l'Opérateur. Les prix sont HTVA par mois.

HSI:

HSI trafic	Interface	Installation	Abonnement
100 Mbit/s	FastEthernet	2814,80	277
200 Mbit/s	GbitEthernet	2814,80	554
400 Mbit/s	GbitEthernet	2814,80	1100
700 Mbit/s	GbitEthernet	2814,80	1446
1 Gbit/s	GbitEthernet	2814,80	1660

VoE trafic utilisant le même port que le trafic HIS (sans frais d'installation), utilisant un autre port (avec frais d'installation):

VoE trafic	Interface	Installation	Abonnement (par Mbps)
0-100 Mbit/s	FastEthernet	2814,80	8,08
101-200 Mbit/s	GbitEthernet	2814,80	7,37
201-400 Mbit/s	GbitEthernet	2814,80	5,35
401-700 Mbit/s	GbitEthernet	2814,80	3,83
701-1000 Mbit/s	GbitEthernet	2814,80	3,02

Pour les RHD vers d'autres sites une offre spécifique est établie sur demande.

5. Conditions commerciales et financières ATH

5.1. Conditions commerciales

5.1.1. Définition des Services ATH

3 types de raccordement ATH sont disponibles :

- "ATH 30"
- "ATH 100"
- "ATH 200"

Les caractéristiques principales au niveau Ethernet sont :

	ATH 30	ATH 100	ATH 200
Maximum downstream	30 Mbit/s	100 Mbit/s	200 Mbit/s
Maximum upstream	10 Mbit/s	50 Mbit/s	100 Mbit/s
y compris un VLAN réservé pour les services VoE	384 kbit/s	384 kbit/s	384 kbit/s

Le VLAN « VoE » est limité exclusivement au transport de signaux en relation avec le protocole « Voice over Ethernet » (VoE). La configuration pour le VLAN est spécifiée au chapitre 2.

Sur demande expresse et écrite du Client Final, l'Opérateur peut demander avec la mise en service d'un raccordement FTTH le portage du numéro téléphonique existant vers le réseau de l'Opérateur. La migration du numéro entraîne d'office la suppression de tous les services liés à cette ligne téléphonique.

L'EPT prend l'engagement de fournir à l'Opérateur les capacités ATH où le produit ATH en question est disponible. L'EPT ne peut pas s'engager à étendre, modifier ou adapter son réseau pour fournir le service ATH ou des capacités plus élevées à l'Opérateur.

Pour permettre à l'Opérateur de vérifier la disponibilité du Service ATH pour un client spécifique, l'EPT met à disposition de l'Opérateur l'accès à un service en ligne, permettant de connaître, en temps réel, l'éligibilité d'une adresse physique précise pour le Service ATH. De même, cet outil renseignera sur le type d'infrastructure disponible à cette adresse.

5.1.2. Réseau dorsal « Metro Ethernet de l'EPT »

La capacité disponible pour le transport des signaux HSI entre les différents points de concentration large bande dans le réseau d'accès de l'EPT (OLT) et le BRAS est utilisé en mode partagé neutre par tous les Opérateurs offrant des services WS DSL et WS ATH.

L'Opérateur peut opter pour une certaine priorisation du trafic HSI au niveau du BRAS. Les termes et conditions pour la vente en gros de cette facilité sont sujets à négociation.

Pour le transport des signaux VoE des VLANs dédiés par Opérateur sont mis en place entre les points de concentration (OLT) et l'équipement de démarcation Ethernet chez l'Opérateur, Les spécifications y relatives sont décrites au chapitre 2.

Le réseau dorsal de l'EPT supporte des "maximum transmission units" avec au maximum 1522 bytes. Les VLANs mis en place pour l'Opérateur sont transparents aux protocoles utilisés au layer 3.

5.1.3. Mise en place du service

5.1.3.1. UserName accès très hauts débits du Client Final

La gestion des utilisateurs et des services par utilisateur est de la seule responsabilité de l'Opérateur.

Pour la partie accès haut débit à Internet (HSI) :

L'accès HSI est offert en mode L2TP Bitstream. Des tunnels L2TP sont établis entre les BRAS de l'EPT et le(s) équipement(s) de terminaison de tunnel de l'Opérateur. Les BRAS de l'EPT initient les tunnels et assurent donc la fonctionnalité LAC (L2TP Access Concentrator). Le(s) équipement(s) de l'Opérateur termine(nt) les tunnels et assure(nt) ainsi la fonctionnalité LNS (L2TP Network Server). Le « UserName » et le « Password » du Client Final sont déterminés et gérés par l'Opérateur lui-même. L'Opérateur est entièrement responsable de la gestion des « UserName » et « Password » ainsi que de l'authentification de ses clients.

Le Client Final établit une session PPPoE de son équipement d'accès vers un des BRAS de l'EPT. Le Client Final doit fournir ses informations d'authentification sous la forme suivante: UserName@domain (p.ex. UserName@isp.lu).

Le BRAS reconnaît sur base de l'extension @domain, avec au maximum 3 extensions par Opérateur, que la session PPP doit être prolongée vers l'Opérateur concerné. La session PPP doit donc être terminée par un équipement de l'Opérateur. L'authentification du Client Final, l'attribution d'une adresse IP ainsi que l'accounting sont sous la responsabilité de l'Opérateur.

L'EPT ne fait pas de vérification de la correspondance entre le raccordement du Client Final et le UserName du Client Final ou le domaine de l'Opérateur. Cette gestion est de la responsabilité exclusive de l'Opérateur. Dans ce contexte, il est à noter qu'un « UserName » créé par l'Opérateur peut être utilisé sur tous les raccordements DSL et ATH même ceux qui n'appartiennent pas à l'Opérateur même. L'Opérateur accepte expressément cette contrainte technique. Afin d'éviter des abus, l'Opérateur est tenu de désactiver les « UserName » dont les raccordements ATH ne lui appartiennent plus.

L'activation de la première extension « @domain » est incluse dans le prix du RHD. Pour chaque nom de domain supplémentaire, « realms », le prix P3 bis du chapitre 5 est applicable.

Pour la partie VoE :

Avec un raccordement FTTH, l'EPT met à disposition de l'Opérateur une connectivité transparente pour les services VoE de l'Opérateur. L'utilisation de cette connectivité est limitée strictement à des applications VoE. La définition des services VoE, la gestion des clients et des services demandés par les Clients Finals sont assurées exclusivement par l'Opérateur.

5.1.3.2. Modalités de connexion

L'accès FTTH s'effectue après authentification du Client Final par l'emploi d'un « UserName » et d'un « Password » qui lui seront communiqués par l'Opérateur avant la première activation de sa connexion.

La connexion au serveur d'accès de l'Opérateur s'effectue par les protocoles PPPoE. Le Service ATH prévoit l'établissement d'une session PPPoE par raccordement ATH et par UserName ATH.

5.1.4. Equipements d'accès et point de démarcation chez le Client Final

5.1.4.1. Equipements actifs d'accès et point de démarcation chez le Client Final

Tous les équipements raccordés à l'accès « accès très hauts débits » y compris le câblage y relatif sont de la responsabilité de l'Opérateur; la responsabilité de l'EPT s'arrêtant au point de démarcation.

Le point de démarcation est, pour les raccordements accès très hauts débits, un port Ethernet sur l'ONT installé par l'EPT chez le Client Final.

5.1.4.2. Transmission

Les débits de transmission upstream et downstream du produit accès très hauts débits ne sont pas garantis et représentent des débits maximums. Le débit réel peut dépendre entre autres de la charge globale du réseau, de l'installation interne auprès du Client Final (câblage, équipements), etc.

Pour la transmission des signaux HSI, la qualité de service pour la partie HSI est de type « Best Effort ». La performance de l'accès dépend également des infrastructures de l'Opérateur et des ressources sur Internet.

Les caractéristiques des flux offerts pour la transmission de services VoE sont spécifiées au chapitre 2.

Les bandes passantes définies dans les spécifications du produit représentent les débits au niveau du protocole IP pour le service HSI et au niveau du protocole Ethernet pour le service Voice over Ethernet. Les débits de bout en bout ne sont pas garantis au niveau du réseau Internet.

5.2. Conditions financières

5.2.1. Prix d'installation

Le prix d'installation du service ATH par connexion réalisée est défini sous P1.

Pour la conversion d'un accès FTTH resp. ATH existant chez un Client Final souhaitant conclure un Contrat ATH auprès de l'Opérateur, le prix P3 est facturé par l'EPT à l'Opérateur.

Les frais d'installation respectivement de modification des paramètres ATH sont facturés le cas échéant par l'EPT à l'Opérateur suivant les tarifs indiqués ci-dessous.

5.2.2. Mensualités

Le prix des mensualités par connexion est repris ci-dessous et correspond à la mise à disposition du Service ATH.

La période minimale contractuelle de chaque raccordement est fixée à T1. La durée minimale de facturation est donc de T1.

Tous les prix sont indiqués en EUR hTVA.

Elément de prix	Désignation	Prix en € hTVA
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P1	Installation d'un raccordement ATH	74,09
P2	Réponse négative à une commande pour un raccordement FTTH* ou suppression d'une commande ATH avant activation	14,98

* Uniquement pour les cas où le moteur de recherche de l'EPT a clairement indiqué que l'adresse en question n'est pas encore ouverte pour les produits FTTH.

P3	Reprise d'un raccordement FTTH ou ATH d'un autre Opérateur par le nouvel Opérateur	16,91
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P3 bis	Activation d'un realm supplémentaire	346,30
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P4	Changement de l'abonnement ATH (Upgrade ou Downgrade) ou migration d'un abonnement VDSL vers un abonnement ATH 50 ou ATH 100	gratuit
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P4 bis	Migration d'un abonnement VDSL vers un abonnement ATH 30	74,09
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P5	Abonnement ATH			
		ATH 30	ATH 100	ATH 200
ATH	<i>Downstream</i>	30 Mbit/s	100 Mbit/s	200 Mbit/s
	<i>Upstream</i>	10 Mbit/s	50 Mbit/s	100 Mbit/s
Abonnement mensuel		30,52 €/mois	33,23 €/mois	39,42 €/mois

P6	Dépannage d'un raccordement en service	frais réels
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Durée	Désignation	
T1	Période contractuelle minimale par raccordement ATH.	6 mois

5.2.3. Dépannage

Période d'intervention (Jours ouvrables, du lundi au vendredi)	L'origine de la panne relève	Tarif
8h00-17h00	Du domaine de responsabilité de l'EPT	Gratuit
8h00-17h00	Du domaine de responsabilité de l'Opérateur	Tarif A

5.2.3.1. L'Opérateur souhaite que le dépannage soit effectué avant une autre signalisation de la part du Client Final ou en dehors des horaires de travail normaux. Dans ce cas, les prix suivants s'appliquent:

Période d'intervention	L'origine de la panne relève	Tarif
Prioritaire de 7h00 à 19h00 (lundi à vendredi) et de 8h00 à 12h00 (samedi)	Du domaine de responsabilité de l'Opérateur ou de celui de l'EPT	Tarif B
De 19h00 à 7h00 du lundi au vendredi, Samedi à partir de 12h00 et le dimanche	Du domaine de responsabilité de l'Opérateur ou de celui de l'EPT	Tarif C

5.2.3.2. Frais de main-d'œuvre

Tarif A = Tarif horaire actuel de la main-d'œuvre de l'EPT plus des surcharges

Tarif B = Tarif horaire actuel de la main-d'œuvre de l'EPT plus des surcharge, avec une facturation minimum de 250 Euros par intervention.

Tarif C = Tarif horaire actuel de la main-d'œuvre de l'EPT plus des surcharges, avec une facturation minimum de 500 Euros par intervention.

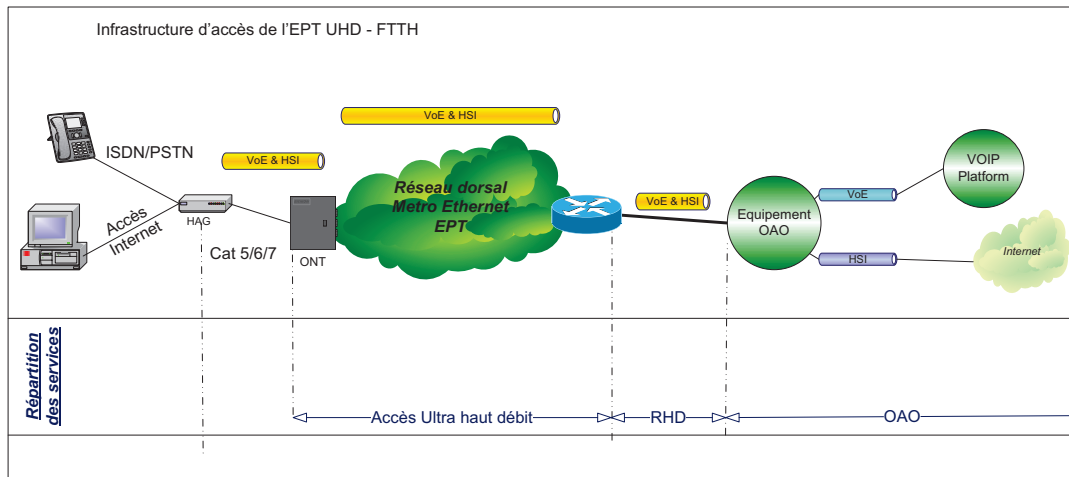
Afin d'éviter toute confusion, les tarifs A, B et C ne sont pas appliqués en cas de panne générale.

6. Profile ATH-1Gbps

6.1. Introduction

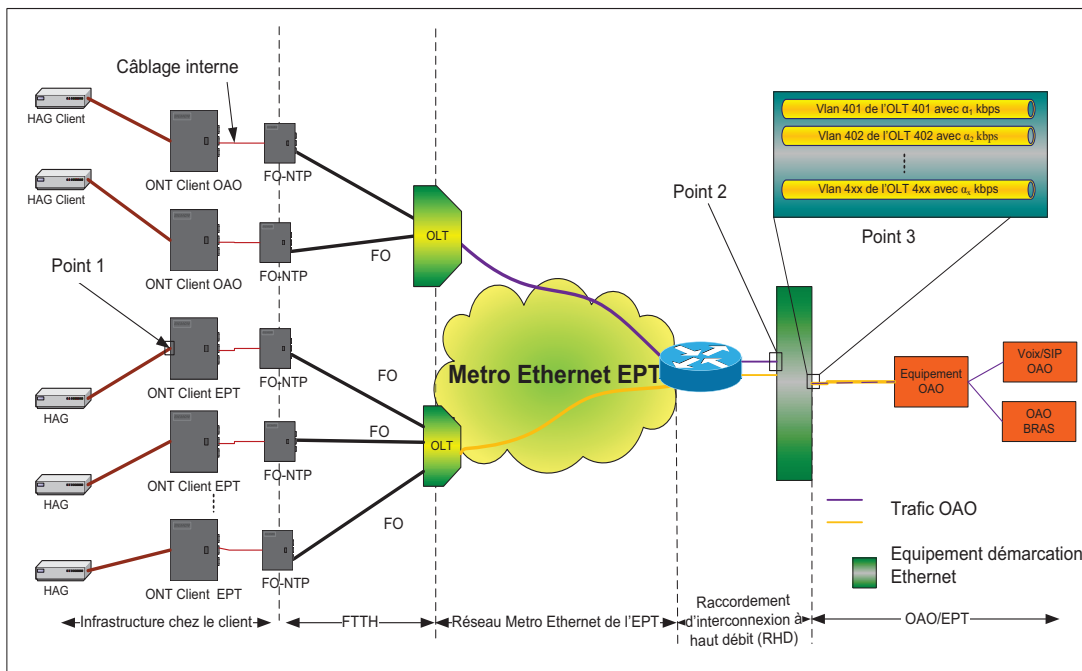
Ce chapitre décrit les modalités techniques et financières du profil 1 Gbps. Toutes les procédures et caractéristiques non décrites dans ce chapitre sont celles des chapitres 1 à 5.

6.2. Schéma technique



6.3. Caractéristiques techniques

L'accès très large bande à 1 Gbit/s est uniquement disponible pour les accès sur fibre optique et en configuration « MONO-VC ».



Point 1 : Le point de terminaison chez le Client Final est une interface Ethernet RJ45 IEEE 802.3ab avec 1.000Mbps en download et 500Mbps en upload, full duplex, forced sur l'ONT (Optical Network

termination). La responsabilité de l'EPT s'arrête à ce point chez le Client Final. Il est à noter que le câblage interne entre la tête terminale optique (FO-NTP) et l'ONT est de la responsabilité du Client Final respectivement de son Opérateur.

Sur la ligne d'accès il n'y a pas de VLAN spécifique à la VoE, le profil 1 Gbps offre une configuration Mono-VC sur la ligne d'accès.

Point 2 : La partie connectivité assure la transmission du flux binaire à travers le réseau de l'EPT, de l'OLT vers le RHD avec une configuration MonoVC. Entre chaque OLT et le RHD l'Opérateur dispose d'un ROOT_VLAN (double tagged).

La capacité EIR (1 ou 10 Gigabit Ethernet) vers chaque OLT est utilisée en mode partagé par tous les Opérateurs y compris l'EPT elle-même. Le réseau Metro Ethernet de l'EPT est dimensionné à ce que le taux de contention ne dépasse pas 1:500. Le ROOT_VLAN est divisé en deux catégories de trafic :

1. Trafic « best effort » EIR

Le réseau Metro Ethernet de l'EPT peut supporter en mode de fonctionnement normal une utilisation moyenne de 8 Mbps par raccordement « ATH-1Gbps » en période de pointe. Cette utilisation est comprise dans le tarif de l'abonnement mensuel par raccordement.

Si le débit total de l'Opérateur dépasse la somme du trafic inclus dans l'offre pour ses raccordements ATH-1Gbps par OLT (# raccordements ATH-1Gbps * 8Mbps par OLT), en période de pointe, le trafic mesuré en plus est facturé suivant la règle des 95th percentile³ au tarif du trafic P0.

L'Opérateur peut marquer le trafic EIR avec les « priority bit » suivant ses besoins. Cette information est transportée de manière transparente à travers le réseau Metro de l'EPT.

2. Trafic « garanti » CIR

Le ROOT_VLAN est préconfiguré avec une capacité CIR de 2,4 Mbps, optimisé pour acheminer du trafic voix, avec les qualités de service comme définies dans le tableau suivant :

Bande passante max	Network Control (NC)			Data VoE			Signalisation VoE		
« Priority Bit »	6			7			5		
2,4 Mbit/s	CIR:	0,15	Mbit/s	CIR:	2,1	Mbit/s	CIR:	0,15	Mbit/s
	CBS:	0,01	Mbyte	CBS:	0,21	Mbyte	CBS :	0,015	Mbyte

Les coûts relatifs à cette capacité sont compris dans l'abonnement mensuel par raccordement.

Jusqu'à quatre mille ROOT_VLAN de l'Opérateur peuvent être acheminés via un seul RHD.

³ 95th percentile signifie que lors des mesures du trafic, 5 % des valeurs, qui regroupent les valeurs les plus élevées, ne seront pas considérées pour le calcul de la bande passante, la valeur retenue est celle qui suit immédiatement la valeur mesurée la plus faible qui a été écartée. L'EPT mesure entre 20 et 22 heures chaque jour en intervalles de 5 minutes les débits en downstream et upstream. La valeur la plus haute est retenue. Par jour il y aura donc 24 valeurs mesurées. Pour un mois de 30 jours il y aura 720 valeurs. La 37^{ème} valeur la plus haute est retenue pour le calcul du trafic EIR. Si l'EPT remarque que la période de pointe diffère de celle retenue pour la mesure, elle sera adaptée en conséquence.

Le flux binaire est transparent au niveau 3 Ethernet IEEE 802.3. La longueur maximale « MTU » est de 1548 bytes. Les différents marquages du trafic EIR ne seront pas pris en compte dans le réseau Metro Ethernet de l'EPT. La priorisation du trafic EIR peut néanmoins se faire soit au niveau du HAG du Client Final soit dans l'équipement de terminaison de l'Opérateur.

Le trafic CIR envoyé par l'Opérateur vers une OLT spécifique en dépassement de la capacité CIR préconfigurée respectivement achetée est considéré et traité comme du trafic EIR.

En cas de violation des paramètres de service définis pour les ROOT_VLAN, le réseau de l'EPT appliquera du "Policing" selon MEF. L'Opérateur doit donc gérer ses flux au niveau Ethernet afin de ne pas violer les paramètres de service.

Point 3 : Au niveau de la liaison RHD, l'Opérateur dispose d'un ou plusieurs ports 10, 40 respectivement 100 Gigabit Ethernet afin d'acheminer les flux binaires des Clients Finaux de l'Opérateur.

Pour connecter les clients 1 Gbps au réseau de l'Opérateur, il doit commander un RHD dédié aux clients 1 Gbps. Ce RHD est terminé par l'EPT sur un équipement de démarcation Ethernet. Le RHD mis à disposition par l'EPT peut être terminé soit dans une salle de colocation, soit dans un autre POP de l'Opérateur.

Les différents ROOT_VLAN peuvent être définis à travers la combinaison S-TAG/C-TAG, le S-TAG identifiant l'équipement de concentration OLT, le C-TAG identifiant le service.

6.4. Conditions tarifaires

RHD

L'offre ci-dessous couvre la mise à disposition d'un raccordement RHD avec une liaison 10, 40 ou 100 GE. Le raccordement RHD est terminé sur un équipement de démarcation de l'EPT installé dans les locaux de l'EPT et prolongé par une paire de fibres optiques monomodes vers le point de présence de l'Opérateur dans la salle de colocation. Les prix sont HTVA par mois.

Frais d'installation :	2814,8 €
Abonnements mensuel :	498,- € port 10 GE
	1.626,1 € port 40 GE
	3.252,2 € port 100 GE

Un prolongement du raccordement vers un POP de l'Opérateur peut être fournie sur base d'une offre sur mesure.

Accès 1 Gbps

Elément de prix	Désignation	Prix en € hTVA
P7	Abonnement mensuel par Service 1 Gbps y inclus la mise à disposition des capacités de transmission de base suivant ce chapitre	85,78€/mois

Trafic

Le trafic EIR par Opérateur et par OLT, dépassant les 8 Mbps par raccordement à l'heure de pointe, est facturé suivant le tarif 6,59€ par Mbps.