

Participant Notice amending ITP

**New Zealand Government Ultra-Fast Broadband Initiative
Invitation to Participate in Partner Selection Process dated
October 2009 (ITP)
PARTICIPANT NOTICE
5 July 2010**

This Participant Notice is given pursuant to section 6.13(g) of the ITP.

1. OVERVIEW

1.1 Amendments to the current model for implementing the UFB Initiative

This Participant Notice amends the ITP service offering and open access requirements as follows:

- (a) LFCs will be required to provide certain Layer 2 Services in addition to certain Layer 1 Services;
- (b) LFCs will not be required to provide access to unbundled Layer 1 Services on the point-to-multipoint parts of their network for an initial period (until 31 December 2019), but will be required to do so after that date; and
- (c) LFCs will be subject to a “non-discrimination” open access standard for an initial period until 31 December 2019, and after that LFCs will be subject to an “equivalence of inputs” open access standard.

The date of 31 December 2019 represents the end of the ten year period for roll-out of ultra-fast broadband to 75 percent of New Zealanders under the UFB Objective.

Explanatory note

The overall intention of the amendments to the ITP relating to Layer 1 Services and Layer 2 Services made through this Participant Notice is to provide the ability for an LFC to price products according to product characteristics and to provide products at prices that are attractive to relevant segments of the market.

It will be mandatory for the LFC to provide an open access Layer 2 wholesale service, with the pricing for this to be determined through the partner selection process. This service will support a “multiple service provider” business model (as specified in Appendix 3).

LFCs are still required to provide the Specified Layer 1 Service as per section 9.5(c)(i) of the ITP (as amended by clause 5 of this Participant Notice), and continue to be permitted to provide additional Layer 1 Services. However, the LFC is not required to unbundle point-to-multipoint Layer 1 Services before 31 December 2019.

To be clear, LFCs are still required to offer point-to-point Layer 1 Services before 31 December 2019. There is also no change in the requirement on LFCs to roll-out fibre networks to Priority Users in the initial years of deployment (the period to 31 December 2015), and that Layer 1 Services/point to point and Layer 2 Services will be made available to these users.

For the avoidance of doubt, regardless of these changes, government investment in the UFB Initiative remains exclusively focussed on funding the Communal Infrastructure as defined in paragraph 32 of Appendix 2 of the ITP (as amended by clause 15.3 of this Participant Notice).

1.2 **Unbundled point-to-multipoint Layer 1 Service**

This Participant Notice amends the service requirements set out in the ITP.

For an initial period until 31 December 2019, LFCs will not be required to provide unbundled access to point-to-point and point-to-multipoint parts of the Network at Layer 1.

From 31 December 2019, LFCs will be required to provide access to all unbundled elements of their Layer 1 Network.

1.3 **Open access standards**

This Participant Notice amends the open access standards set out in Appendix 4 of the ITP.

LFCs will not be subject to the “equivalence of input” requirements that were set out in the ITP, for the period prior to 31 December 2019 – instead a “non-discrimination” standard will apply. However, LFCs *will* be required to implement “equivalence of inputs” by 31 December 2019.

Respondents must set out how the “non-discrimination” open access standard will be applied in their proposals. CFH will review proposals on this point, and the final detailed requirements for “non-discrimination” will be negotiated and included in a Deed of Undertaking to be given by the LFC to the Crown, which will be enforced by the Commerce Commission (the **Commission**). CFH will also have the ability to impose penalties or equivalent financial consequences via its contracts with LFCs and Partners.

1.4 **Information disclosure**

LFCs will be required to provide information on a six-monthly basis to both CFH and the Commission. This information disclosure requirement will include pricing, asset costs, and revenue information.

1.5 **Capability**

This Participant Notice introduces a requirement that LFCs must establish their businesses with the capability to implement “equivalence of inputs” by 31 December 2019 by:

- (a) ensuring there is sufficient space in ducts (and or additional dark fibres) to accommodate additional Access Seekers (a rule of thumb being a duct or fibre oversubscription ratio of 1x premises in addition to allowances for growth (infill), faults and dedicated services); and
- (b) ensuring that the LFC’s OSS/BSS systems are capable of “equivalence of inputs” on implementation.

1.6 **Other Changes in this Participant Notice**

Other changes in this Participant Notice include:

- (a) amendments to Appendix 3; and
- (b) updated definitions for key terms.

2. DEFINITIONS AND INTERPRETATION

- (a) Section 7.1 of the ITP is amended by replacing the definition of **CCPM** with the following:

“CCPM means, in respect of an LFC and each Specified Layer 1 Service and Specified Layer 2 Services, the maximum amount that LFC will be entitled to charge an Access Seeker per month for providing each Layer 1 Service and Layer 2 Service that the LFC provides;”

- (b) Consequential to the above amendment, the words after “(CCPM)” in paragraph 89 of Appendix 2 of the ITP are deleted.

- (c) Section 7.1 of the ITP is amended by replacing the definition of **Permitted Services** with the following:

“Permitted Services means the services that may be provided by an LFC, being the services listed in the Pricing Schedule and, subject to CFH consent, any additional Layer 1 Service or Layer 2 Service;”

- (d) Section 7.1 of the ITP is amended by replacing the definition of **Specified Layer 2 Service** with the following:

“Specified Layer 2 Services means the Layer 2 Services that are listed in the Pricing Schedule and if applicable are required to comply with that technical product specification;”

- (e) Section 7.1 of the ITP is amended by adding the following definitions:

“Communal Layer 2 Infrastructure means any electronics and/or optical equipment the LFC may be required to install in the LFC’s cabinet and/or Central Office/Point of Interconnect and any active electronics installed in the Central Offices or cabinets required to provide the Specified Layer 2 Service;”

“Connection means the cable joining the Fibre Access Point to the External Access Point of a premise. This cable can be either from the pit on the adjoining boundary of two properties where the Fibre Access Point is located in underground deployment, or from the pole nearby to a number of premises in aerial deployment;”

“Consumer means, in relation to a Telecommunications Service, a person that is the ultimate recipient of a Telecommunications Service;”

“CPPP_{L2} means, in respect of an LFC, the incremental cost per premise passed for the Communal Layer 2 Infrastructure, reflecting the extra investment required to provide the Layer 2 Service, which is calculated as the total forecast cost to build out and/or acquire all of the Layer 2 Communal Infrastructure required by that LFC to meet the Layer 2 coverage committed to by the Partner for that LFC for the LFC Coverage Area, divided by N_{passed} ;”

“Initial Period means the period ending on 31 December 2019;”

“IRU means indefeasible right of use which is an exclusive, unrestricted and indefeasible right to use the relevant capacity (including equipment and fibre capacity) for a defined period, with payment being made up front in present value;”

“NBAP means a Non Building Access Point, being a location for a connection that does not have a physical address (e.g. a bus shelter, lamp post);”

“Passed means when a Premise has been passed with Communal Infrastructure and is capable of Connection from the nearest point to the private boundary (if underground) or nearest pole (if aerial);”

“Point-to-multipoint means a general term that describes a network configuration enabling each dark fibre to provide multiple end point connections, for example GPON, EPON, BPON and active equipment;”

“Premise means a single building or structure located on a defined geographical site (such as may be evidenced by a certificate of title), which has a unique physical address recognised by NZ Post, and is occupied by or could readily be occupied by a potential End User or End Users. For the avoidance of doubt, a premise does not include a NBAP, and a multi-tenanted building or structure only constitutes a single Premise;”

“Pricing Schedule means Schedule 5 of the request for refinements letter dated 5 July 2010;”

“Proposed Price means the price that the Respondent intends an LFC to charge for a given service during the Concession Period that is not greater than the CCPM provided by the Respondent for that service;”

“Subsequent Period means the period from 1 January 2020;”

“Subsequent Period Specified Services means Specified Layer 1 Services as set out in Schedule 5(b), which relate to services provided from 1 January 2020;”

3. LFC SERVICES

3.1 Pricing of Services

- (a) Respondents are required to provide the pricing information requested in the Pricing Schedule. This relates to:
 - (i) overall pricing information for the Specified Layer 1 Service and the Specified Layer 2 Services; and
 - (ii) pricing information for various products and components that are an input into the Specified Layer 1 Service and the Specified Layer 2 Services.

3.2 Specified Services

- (a) **Initial Period Specified Services**

During the Initial Period, an LFC will be required to provide the services as outlined in the Pricing Schedule 5(a).

(b) Subsequent Period Specified Services

In addition to the services listed in clause 3.2(a), during the Subsequent Period, LFCs are also required to provide services listed in the Pricing Schedule 5(b) in accordance with the technical product specifications recorded in Appendix 3:

- (c) For the avoidance of doubt, an LFC is not precluded from providing the services listed in Schedule 5(b) during the Initial Period, provided that the price for those services must be approved by CFH.
- (d) An LFC may, subject to CFH consent, provide additional services to the Specified Layer 1 Service and Specified Layer 2 Services in Schedule 5.

4. OVERRIDING OBJECTIVES

Section 9.3(d) of the ITP is deleted and replaced with the following:

“(d) provide the Specified Layer 2 Services within the LFC Coverage Area, and where the LFC invests in additional Layer 2 Services to make those Layer 2 Services available within the LFC Coverage Area;”

5. LFC CONSTITUTION

Section 9.5(c) of the ITP is deleted and replaced with the following:

“(c) The constitution of the LFC (which is to be adopted on incorporation) will contain a number of broad requirements on what the LFC must do, may do and must not do in the course of business. These will include:

- (i) an LFC must:*
- deploy and make fibre available⁴ in the Proposed Coverage Area;*
 - provide open access⁵ to all services provided on the LFC’s Network; and*
 - provide the Specified Layer 1 Service and the Specified Layer 2 Service, and access for NBAP on request; and*
- (ii) an LFC may, subject to CFH consent, provide:*
- any Layer 1 Service in addition to the Specified Layer 1 Service; and*
 - any Layer 2 Service in addition to the Specified Layer 2 Service; and*
- (iii) an LFC must not provide any other services (using the LFC’s Network or otherwise).”*

⁴ As defined in footnote 3 above.

⁵ As discussed in section 13.

6. PROVISION OF LAYER 2 SERVICES

Specified Layer 2 Services

Section 12 of the ITP is amended as follows:

- (a) The existing section 12.1 is deleted and replaced with the following:

“12.1 Specified Layer 2 Services

An LFC must provide the Specified Layer 2 Services in accordance with the Open Access Requirements.”

- (b) The existing section 12.2(b) is deleted and replaced with the following:

“(b) The relevant Partner will fully fund the provision of Layer 2 Services, including the cost of all electronic and optical equipment and technology required to be connected to the dark fibre in Layer 1 in order for Layer 2 Services to be made available.”

7. OPEN ACCESS REQUIREMENTS

7.1 Open Access Requirements

Section 13.1 of the ITP is amended as follows:

- (a) section 13.1(c) is deleted and replaced with the following:

“(c) LFCs must provide the Specified Layer 1 Service and the Specified Layer 2 Services; and”

- (b) the existing section 13.1(d) is deleted, with paragraph (e) then becoming paragraph (d).

7.2 Open Access guiding principles

Section 13.2(d) of the ITP is deleted and replaced with the following:

“(d) non-discrimination: services provided by an LFC should be offered to all Access Seekers on the same terms and conditions except where variations can be objectively justified, even if the Access Seeker is a competitor or a downstream arm of a network competitor.”

7.3 Equivalence Capability

An LFC is required to implement its Network and OSS/BSS systems at initial deployment in a way that is capable of satisfying the non-discrimination requirements contained in Appendix 4A and the equivalence and non-discrimination requirements contained in Appendix 4B of this ITP.

7.4 Non-discrimination and equivalence

Section 13.3 is deleted and replaced with the following:

“13.3 Non-discrimination and equivalence:

- (a) During the Initial Period the LFC will be required to comply with the non-discrimination requirements set out in Appendix 4A.***
- (b) During the Subsequent Period, the LFC will be required to comply with the equivalence and non-discrimination requirements set out in Appendix 4B.***
- (c) For the avoidance of doubt, the requirements imposed on the LFC by sections 13.3(a) and 13.3(b) will not substitute for or limit the obligations on the LFC to comply with the Commerce Act 1986, the Telecommunications Act 2001, or any other applicable legislation or regulation.”***

8. INFORMATION DISCLOSURE

LFCs will be required to provide information on a six-monthly basis to both CFH and the Commission. This information disclosure requirement will including pricing, cost and revenue information.

9. NBAP SERVICES

The LFC is required when requested by an Access Seeker to provide a Specified Layer 1 Service or Specified Layer 2 Services to an NBAP. The price for a NBAP service will not be assessed under the Evaluation Criteria and CFH’s consent is not required in respect of the price set for a NBAP service. The Price for a NBAP service will be in two components:

- (a)** a monthly fee intended to cover operational costs and utilisation of shared network and equipment to provide the service; and
- (b)** an upfront capital cost to reflect the incremental capital cost of providing the service, which is to be supplied in the form of a quote/estimate to the Access Seeker (within 30 days).

The Respondent is required in the Pricing Schedule to provide a monthly Proposed Price for a NBAP Layer 1 Service.

10. PROHIBITION OF OFFERING CERTAIN SERVICES

- (a) The LFC is prohibited from directly offering any of the Services to End Users.
- (b) Subject to paragraph (a) above, an LFC is permitted to purchase Permitted Services from itself in accordance with Appendix 4A and Appendix 4B of the ITP (as applicable) and for its own consumption in order to provide the Specified Layer 1 and Layer 2 Services.
- (c) The LFC is prohibited from offering any services above Layer 2 other than as required to provide the Multicast Service described in Appendix 3 without CFH's agreement or, in the absence of CFH, the Crown's agreement in accordance with its rights pursuant to the Government Share.

11. TECHNICAL SPECIFICATIONS

Appendix 3 of the ITP is deleted and replaced with the new form of Appendix 3 attached to this Participant Notice.

12. EQUIVALENCE AND NON-DISCRIMINATION

- (a) Appendix 4 of the ITP is deleted
- (b) Appendix 4A attached to this Participant Notice is formally incorporated into the ITP and will apply to LFCs during the Initial Period.
- (c) Appendix 4B attached to this Participant Notice is formally incorporated into the ITP and will apply to LFCs during the Subsequent Period.
- (d) For the avoidance of doubt, Appendix 4A and Appendix 4B apply to all services that the LFC elects to provide, including additional services to the Specified Layer 1 Service and the Specified Layer 2 Services.

13. EVALUATION CRITERIA

13.1 Overview of the Evaluation Criteria

Section 19.1(c) of the ITP is deleted and replaced with the following:

- “(c) the amount of the CCPM and proposed pricing (if applicable) for each Layer 1 Service and Layer 2 Service (lower amounts will be evaluated more favourably as set out in the Pricing Schedule);”*

13.2 Appendix 6

Appendix 6 of the ITP is amended as set out in clauses 13.3 and 13.4 of this Participant Notice.

13.3 CPPC

Paragraph 10, forming part of Section 4 of Appendix 6 (The Cost to Connect Each End User Premises (CPPC)) of Appendix 6 is deleted and replaced with the following:

“10. Each Proposal will be assessed as to the forecast average cost of connecting each End User premises to the LFC’s Communal Infrastructure and Communal Layer 2 Infrastructure (as applicable). A Respondent must provide its proposed CPPC or CPPC_{L2} (as applicable).”

13.4 CPPM

(a) Paragraph 11, forming part of Section 5 (The Monthly Charge to Access the LFC’s Network (CCPM)) of Appendix 6 is deleted and replaced with the following:

“11. Each Proposal will be assessed as to the proposed Customer Charge Per Month (CCPM) for each of the LFC’s Specified Layer 1 Service and Specified Layer 2 Services as set out in the Pricing Schedule, which will be the monthly maximum price the LFC will be entitled to charge Access Seekers for each End User to whom the relevant Layer 1 Service or Layer 2 Service is provided.”

(b) The following paragraphs are added to the end of Section 5 (The Monthly Charge to Access the LFC’s Network (CCPM)) of Appendix 6 and the subsequent paragraphs of Appendix 6 are renumbered accordingly:

“12. Each Proposal needs to include the Proposed Price for year 1 and Proposed Price for year 10 for each Layer 1 Service and Layer 2 Service where this is less than the CCPM for that service, as set out in the Pricing Schedule.”

“13. For evaluation purposes, where the Respondent has in addition to CCPM included Proposed Prices (year 1 and year 10) then the Respondent must outline the period the Proposed Prices will be available to all Access Seekers.”

“14. For the avoidance of doubt, in addition to CCPM, each proposal will be assessed as to the Proposed Prices (where applicable) for each of the LFC’s Layer 1 Services and Layer 2 Services.”

“15. Respondents may, in addition to the above, provide IRU pricing for ten and twenty years for each Specified Service, outlined in Schedule 5. Where IRU pricing is provided, the discount rate must be disclosed.”

14. 9 DECEMBER 2009 PARTICIPANT NOTICE

14.1 9 December 2009 Participant Notice

The 9 December Participant Notice is amended as set out in clauses 13.2 and 13.3 of this Participant Notice:

14.2 Costs

(a) The following paragraph is to be inserted immediately following clause 1.1(a):

“(b) CFH acknowledges that there may be differences in the costs of providing a given Specified Layer 2 Service. CFH wishes to clarify that Respondents may propose a single CPPCL2 calculated as the forecast average cost of the extra investment required to install the End User-Specific Infrastructure to provide the range of Specified Layer 2 Services offered by the LFC, based on all potential End User connections to that LFC’s Communal Layer 2 Infrastructure across the LFC Coverage Area.”

(b) The current clause 1.1(b) is renumbered as clause 1.1(c).

14.3 Price

(a) The current clause 1.3(a) is deleted and replaced with the following:

“(a) A Respondent may only propose a single CCPM for a given Permitted Service.”

(b) The current clause 1.3(b) is deleted and replaced with the following:

“(b) However, where there is a significantly higher CPPC in respect of a particular End User for a given Permitted Service, the LFC may charge a reasonable amount in addition to the CCPM for that Layer 1 Service or Layer 2 Service to recover the additional cost of connecting that End User.”

15. CONSEQUENTIAL CHANGES

Consistency with Section 1

- (a) The amendments made to the ITP by the previous clauses of this Participant Notice reflect the more substantive changes required to the provisions of the ITP in relation to Layer 1 Services and Layer 2 Services. There are, however, numerous other consequential changes required to other provisions in the ITP to reflect the above amendments. Rather than enumerate and describe these consequential changes at length in this Participant Notice, all relevant provisions in the ITP are hereby deemed to be amended, in the manner and to the extent required, to be consistent with and give full effect to the amendments made to the ITP by the previous clauses of this Participant Notice.
- (b) By way of example of the consequential changes referred to in paragraph (a) above, the following provisions in the ITP refer to or reflect (in various ways) the provision of Layer 2 Services being at the LFC's discretion and subject to CFH consent, and accordingly are deemed to be amended, in the manner and to the extent required, to be consistent with and give full effect to the amendments made to section 12 of the ITP by clause 6 of this Participant Notice:
 - (i) section 9.1(b);
 - (ii) section 9.6(b);
 - (iii) Appendix 2, paragraph (10)(c);
 - (iv) Appendix 2, paragraph (60);
 - (v) Appendix 2, paragraph (68);
 - (vi) Appendix 2, paragraph (84);
 - (vii) Appendix 7, 4(D)(28);
 - (viii) Appendix 7, 5(D)(12);
 - (ix) Appendix 7, 5(D)(13);
 - (x) Participant Notice 9 December 2009, clause 3.1(a); and
 - (xi) Participant Notice 9 December 2009 clause 3.1(b).

16. OTHER ITP CHANGES

15.1 Contact Person and Authorised Representatives

- (a) Pursuant to section 3.1(b) of the ITP, the ITP Contact Person is changed from Mr Nick Manning to Mr Tony Pigou (Project Manager, Crown Fibre Holdings Limited).
- (b) The Contact Person's contact details are:
- Crown Fibre Holdings Limited
Level 10 PricewaterhouseCoopers Tower
188 Quay St
PO Box 105321
Auckland 1143
Phone: +64 9 9121970
Email: Tony.Pigou@crownfibre.govt.nz
- (c) The Authorised Representatives are:
- (i) Mr Simon Allen (Chairman, Crown Fibre Holdings Limited);
 - (ii) Mr Graham Mitchell (Chief Executive Office, Crown Fibre Holdings Limited); and
 - (iii) Mr Sean Wynne (Chief Commercial Officer, Crown Fibre Holdings Limited)

15.2 LFC Board

- (a) Section 9.5(d) is deleted and replaced with the following:
- “(d) During the Concession Period the Board of the LFC will be made up of no more than seven directors, comprising an equal number of directors appointed by each of CFH and the Partner and a mutually agreed independent chairperson.”*
- (b) Section 9.5(e)(i) is deleted and replaced with the following:
- “(i) Where a Partner, or a related associated entity of a Partner, owns or controls a business which provides any Telecommunications Services other than the Permitted Services⁶, the Board of the LFC will be made up of no more than seven directors, comprising an equal number of directors appointed by each of CFH and the Partner and a mutually agreed independent chairperson.”*
- (c) Appendix 2, paragraph 13 is deleted and replaced with the following:
- “13. During the Concession Period the Board of the LFC will be made up of no more than seven directors, comprising an equal number of directors appointed by each of CFH and the Partner and a mutually agreed independent chairperson.”*

⁶ See section 13.4 for an explanation of the restrictions on director appointments which may apply where a Partner controls a business which provides fibre optic network services other than the Permitted Services.

15.3 The Communal Infrastructure

- (a) Appendix 2, paragraph 32 is deleted and replaced with the following:

“32. The LFC’s Network will contain communal infrastructure, being the network infrastructure in the Proposed Candidate Area which is deployed independently of any specific End User equipment and which is not located on End Users’ sites or premises (the **Communal Infrastructure**). The Communal Infrastructure will include any of the following items within a Candidate Area:

- (a) interconnection points;
- (b) Central Offices;
- (c) cabinets, or fibre cross connection points deployed in the field;
- (d) intra-Candidate Area backhaul fibre connecting the interconnection points, Central Offices and cabinets (as appropriate);
- (e) distribution fibre running along each street, past End User premises;
- (f) feeder fibre running from the Central Offices to cabinets or fibre cross connection points deployed in the field;
- (g) the associated ducts and other fixed civil infrastructure required to deploy these fibre assets; and
- (h) any passive optical equipment the LFC may be required to install in the LFC’s cabinet and/or Central Office.”

15.4 The End User Specific Infrastructure

- (b) Appendix 2, paragraph 59 is deleted and replaced with the following:

“59. The LFC will need to install further infrastructure and systems to provide service to End User connections as those services are contracted for by Access Seekers. This End User-specific infrastructure (**End User-Specific Infrastructure**) will include:

- (a) fibre from an End User’s premises to the LFC’s Communal Infrastructure already in place outside the boundary of an End User’s premises;
- (b) any electronics and/or optical equipment the LFC may be required to install on an End User’s premises;
- (c) the associated ducts and other fixed civil infrastructure required to deploy these End User-specific fibre assets;
- (d) any capitalised investment directly associated with each marginal End User (for example, the value of any software licenses that might be supplied to the LFC on a “per End User” basis); and

(e) *any active electronics installed in the End User's premises required to provide the Specified Layer 2 Service."*

(c) Appendix 2, paragraph 60 is deleted and the subsequent paragraphs of Appendix 2 are renumbered accordingly.

15.5 **Payment by the LFC for the Communal Infrastructure**

The words "*premises passed*" in Appendix 2, paragraph 56 are deleted and replaced with "*Premises Passed*".

15.6 **Funding of the LFC's End User-Specific Infrastructure and Communal Layer 2 Infrastructure "B" Shares**

(a) The heading in Appendix 2 "**Funding the LFC's End-User-Specific Infrastructure**" is deleted and replaced with "**Funding of the LFC's End User-Specific Infrastructure and Communal Layer 2 Infrastructure "B" Shares**".

(b) The following paragraph is inserted immediately below Appendix 2, paragraph 72 (now renumbered 71 in light of the deletion of paragraph 60):

"72 The LFC will acquire the Layer 2 Communal Infrastructure from the Partner, as each stage or segment is completed and is accepted by both the Partner and the LFC. The amount payable by the LFC under the Network Procurement Agreement will be satisfied via issuing the Partner with "B" shares to the value of CPPPL2 times the number of Premises Passed in that stage or segment."

15.7 **Inflation**

(a) Appendix 2, paragraph 91 is deleted and replaced with the following:

"91. CFH recognises that CPPP and CPPC will need to be adjusted during the concession period to reflect the effect of inflation. CFH proposes that these values will be reset at the beginning of each financial year of the LFC, to reflect the movement in the relevant index over the just-completed financial year."

(b) Appendix 2, paragraph 93 is deleted and replaced with the following:

"93. At the beginning of the LFC's financial year the value of CPPP will be adjusted to reflect movement in the Producer Price Index (PPI) over the just-completed financial year."

(c) The word "CPI" is deleted from Appendix 2, paragraph 96 and replaced with the word "PPI".

(d) The heading in Appendix 2 "**Adjusting CCPM**" is deleted and replaced with "**Bi-Annual Pricing Review**".

(e) Appendix 2, paragraph 98 is deleted and replaced with the following:

“98 At the completion of the second financial year of the LFC and at the completion of each subsequent two-year period, CPPP, CPPPL2, CPPC, CPPCL2, CCPM and CCPML2 will, at CFH’s discretion, be subject to review. In the event of a review, if CFH and the Partner cannot agree on an adjustment, the relevant value will remain unchanged.”

- (f) Appendix 2, paragraph 99 is deleted and the subsequent paragraphs of Appendix 2 are renumbered accordingly.

15.8 UFB Objective

- (a) Section 1.1 of the ITP is amended by adding the following after the box containing the definition of the UFB Objective:

“These timeframes run from the government’s decision to pursue this policy in 2009. Accordingly, the roll-out to priority broadband users plus greenfield developments and certain tranches of residential areas is expected to be completed by 31 December 2015, with the balance of the roll-out being completed by 31 December 2019.”

- (b) Appendix 2, paragraph 3 is amended by adding the following words before the full stop at the end of that paragraph:

“for completion by no later than 31 December 2019”

- (c) Appendix 2, paragraph 47 is amended by adding the following words before the full stop at the end of that paragraph:

“to 31 December 2019”

17. INTERPRETATION

Unless the context otherwise requires, all capitalised terms and abbreviations used in this Participant Notice that are defined in the ITP have the same meaning in this Participant Notice as the ITP.

APPENDIX 3

NETWORK TECHNICAL SPECIFICATIONS, SERVICE DEFINITIONS AND INTERCONNECTION REQUIREMENTS

This Appendix sets out an operational requirement for an LFC to provide:

- open access at Layer 2
- open access at Layer 1

Layer 1 and Layer 2 Specified Services access services are both to be provided on a non-discriminatory basis during the Initial Period in accordance with Appendix 4A of the ITP, and on an equivalence and non-discriminatory basis during the Subsequent Period in accordance with Appendix 4B of the ITP.

It is expected that the LFC access network structure will consist of a hybrid of point to point and point-to-multipoint topologies with the point-to-multipoint topology primarily being used to serve mass market and small business segments.

The LFC Layer 1 network shall be provisioned in such a way that over time it will accommodate further Access Seekers wishing to gain access to Layer 1 services on an open access and unbundled basis.

Provisioning rules will need to be developed by each LFC to suit their own circumstances, but the following guidelines can be taken as overall national expectations. Regardless of the fibre provisioning rules adopted, the LFC ducts and aerial infrastructure should be provisioned such that requirements for growth over 50 years and for future Access Seekers can be accommodated (rule of thumb being set out below).

Points of Interconnect (POI) for Layer 2 Services: It is desired to minimise the overall number of POIs in order to ease connection of Retail Service Providers. There should be no more than two per candidate area, with no more than one where a candidate area serves less than 50,000 homes. Where there are two POIs they should provide for full redundancy (i.e. each CO connects to each POI).

Fibre network provisioning:

In the distribution network two strands of fibre should be allowed for each premise.

A growth rate for infill development of 40% of premises should be allowed for both feeder and distribution fibre.

An allowance should be made of 5% of premises for point to point services within a point-to-multipoint serving area. This will be higher in Business Districts.

An allowance should be made of 10% of fibres for redundancy and faults in both feeder and distribution fibre.

A suggested allowance of 1x premises to permit future Layer 1 unbundling post 31 December 2019.

Central Offices

LFCs can, but are not required to provide accommodation and facilities for point-to-point Layer 1 Access Seeker. Where this accommodation is not provided by the LFC, the LFC must make provision for a tie cable or access fibre backhaul service from a Central Office to a handover point at the Access Seekers' requested point of delivery. This access fibre backhaul service must comply with the specification "Ultra Fast Broadband Intra-LFC Area Access Fibre Backhaul Service Description" under development with the industry through the Telecommunications Carriers' Forum. With this service the Access Seeker's requested point of delivery shall be within the LFC's Candidate Area.

Should the Access Seeker's requested point of delivery lie outside the LFC's Candidate Area then interconnection should be provided through the use of commercially available backhaul services.

Street Cabinets or Fibre Flexibility Points

LFCs may, but are not expected to, provide accommodation for Access Seeker point-to-multipoint splitters or equipment to be located in the LFC's street cabinets or fibre access points. Where this accommodation is not provided the LFC must make provision for a tie cable from the cabinet or fibre flexibility point to the Access Seeker's cabinets / fibre flexibility points. This tie cable is to terminate within the fibre serving area.

1. INTRODUCTION

1. CFH will maintain a set of technical and operational standards relating to the services provided by LFCs. These will be developed in consultation with the industry and, once finalised by CFH, will apply to all LFCs.
2. The following Network technical specifications, service definitions and interconnection requirements will form the basis of these standards.

2. NETWORK TECHNICAL SPECIFICATIONS

Fibre Optic Cable

1. All dark fibres must comply completely with either the ITU-T G.652D standard for single mode optical fibre and cable for the Access Network. However internal access cables may conform with ITU-T G.657A which is resilient to bending and also suited patch cords etc.
2. Dark fibre termination must be provided by SC APC connector type (complying with the IEC 61754-4 standard) or LC APC type connectors complying with the IEC 61754-20 standard as appropriate.
3. For point-to-multipoint based networks the dark fibre lengths between the ONU and MUX or OLT must be designed to comply with an operational loss budget which will be sufficient to remain within the distance limitations specified in the ITU G.984 (GPON) standard for the life of the fibre, and include sufficient allowance for initial splices and terminations as well as for losses subsequently incurred through the rectification of failures, re-configurations, and faults. It should be noted that should extended distances be required ITU standards compliant extended reach GPON equipment is available, although in no case should the range exceed 40Km.

Central Offices

4. The LFC is required to connect dark fibres from large numbers of individual End User premises back to Central Offices in the LFC Coverage Area. The Central Office is the point of interconnection at Layer 1 to the LFC's dark fibre network.

Co-location

5. Central Offices (COs) are where the LFC will locate their facilities or equipment (OLTs and / or MUXs as applicable) in order to access the LFC's dark fibre. The LFC is not obliged to provide co-location facilities for unbundled point-to-multipoint services at the Central Office. However LFCs are obliged to provide co-location facilities for point-to-point services. The Co-Location Services offered must comply with the specification "Ultra-Fast Broadband Co-location Service Description" under development with the industry through the Telecommunications Carriers' Forum.
6. Points of Interconnection (POIs) are special cases of a Central Office. They may include all CO functions and will include an access point for Layer 2 Services. The Layer 2 Point of Interconnect (POI) is where Retail Service Providers will locate their network routers, Layer 2 Ethernet switches and backhaul facilities and equipment in order to gain access to Layer 2 Services offered by LFCs. Therefore POIs must provide a co-location service.
7. Where unbundled point-to-multipoint co-location services are not offered in a CO, allowance must be made for the provision of a tie cable to an Access Seeker's Central Office facility located within the LFC's fibre serving area.
8. Where co-location services are offered, in either a CO or a POI, they must comply with the Telecommunications Carrier Forum's "Ultra-Fast Broadband Co-location Service Description". This document is under development by the TCF.
9. The Access Seeker is responsible for deployment and management of its facilities and OLT/MUX at the Central Offices where this co-location service is offered.
10. Co-location services are separate from the Layer 1 Services covered elsewhere in this Appendix and the ITP document, and the LFC may charge Access Seekers for their co-location services.

Access to Central Offices

11. The LFC must provide Access Seekers with access to the Central Offices in order for the Access Seekers to connect the Central Office with other networks, including providing connections to intra-LFC Candidate Area backhaul, whether or not that service is provided by the LFC.
12. Inter-network connectivity is a separate service from the Layer 1 Service covered elsewhere in this Appendix and the ITP, and the LFC may charge Access Seekers for their inter-network connectivity.

Layer 2 Points of Interconnect

13. The Layer 2 Point of Interconnect (POI) is where Retail Service Providers will locate their network routers, Layer 2 Ethernet switches and backhaul facilities and equipment in order to gain access to Layer 2 Services offered by LFCs.
14. The Layer 2 POI may or may not be located within or alongside an LFC Central Office, and there may be fewer Layer 2 POIs than Central Offices within an LFC Coverage Area.
15. Where LFCs provide a Layer 2 POI, the LFC must provide co-location services to Access Seekers to support Access Seekers locating facilities or equipment in the POI. Co-location services must comply with the Telecommunications Carrier Forum's "Ultra-Fast Broadband Co-location Service Description".
16. The Layer 2 POI then must:
 - a. provide housing for the appropriate infrastructure and / or network equipment;
 - b. enable the convenient linking of terminal equipment and / or systems to enable the provision of internetwork connectivity;
 - c. make provision for the LFC to be able to provide a co-location service for equipment of Access Seekers accessing the LFC's Layer 2 Services; and
 - d. provide the environmental services required to support the above.
17. The Access Seeker is responsible for deployment and management of its facilities and equipment at the POI.

Multi-Tenant Buildings

Fibre connections to multi-tenant buildings

18. Some building types, such as apartments, commercial offices or residential campuses, contain a number of interconnected premises. Each premise represents a potential End User who can elect to take service independently of the other premises in the multi-tenant building. The LFC must be able to provide service to any or all of the premises in the multi-tenant building.
19. In some cases it will make practical sense, from a deployment point of view, for the LFC to provide an individual fibre connection for each individual residence or commercial tenancy in a multi-tenant building.

20. Where this does not make practical sense, such as for a large apartment building, then the LFC must provide sufficient fibre to that building to meet the needs of the entire building, consistent with:
- a. the number of premises in the building; and
 - b. the chosen network architecture.
21. The LFC's access network will be considered to have passed a multi-tenant building if the network duct and/or fibre are located in an access point at the boundary of the building. The boundary between the LFC's communal infrastructure and the End-User specific infrastructure will be at the fibre access point on the boundary of the building.

Termination Point

22. The LFC must terminate the lead-in fibre(s) to the building inside the multi-tenant building at a location that makes sense to the LFC (CFH expects that in most cases this is likely to be a utilities or services room).¹
23. The LFC is not responsible for designing or installing the technology solution to extend service from the termination point within the building to each individual premise. This will be the responsibility of the building owner or body corporate (as appropriate). The LFC may choose to provide services and offer solutions to the building owner or body corporate, but is not obliged to do so.

3. THE SPECIFIED LAYER 1 SERVICE

General Requirements

24. The LFC must offer the Specified Layer 1 Services as per Schedule 5(a) and make it available on equivalent of inputs basis and conditions to all Access Seekers by 1 January 2020 together with Specified Layer 1 Services as set out in Schedule 5(b).
25. The Specified Layer 1 Services (whether point-to-point or point-to-multipoint) must be designed to support a minimum connect speed of 100Mbps downstream and 50Mbps upstream. This is intended to be measured at the nominal physical bit rate across the electrical interface. It is acknowledged that any usable information rate at Layer 2 will be less than this "headline" rate.
26. The Specified Layer 1 Service must be designed to support future growth via an upgrade path to speeds at least 10x these levels over the asset life.

¹ This is different to the ITP Participant Notice released on July 14, that said:

"The termination point on the End User's premises is to be a suitable fibre termination facility located as an attachment to an external part of the building or structure located at the End User's premises, at such location as best makes sense to the LFC."

Termination Points

On LFC premises

27. The termination point on the LFC's premises is to be at a Central Office site, which will typically terminate the fibre strands that service several thousand, or potentially tens of thousands, of End Users' premises. Specifically, the termination point will be the SC or LC connector which plugs into the OLT or MUX (as appropriate) in the LFC's Central Office.
28. For the avoidance of doubt, if a fibre distribution hub, cabinet or similar is used as part of the Network architecture then the service extends beyond that point to the Central Office.

On End User's premises

29. The termination point on the End User's premises (except where the premises are in a multi-tenant building), is to be inside the End User's premises, at such location as best makes sense to the LFC. Specifically, the termination point will be the ' SC connector which plugs into the ONU inside the End User's premises.
30. On the outside of the End User's premises (except where the premises are in a multi-tenant building), a suitable external fibre access point shall be installed to allow for insertion of a break and test facility.
31. The boundary between the LFC's communal and End-User specific infrastructure will be the fibre access point at the End-User's premises boundary.

Network extent

32. The Specified Layer 1 Service must include all of the network elements between and including these two termination points. The price of the Specified Layer 1 Service must be based on all these network elements.
33. However, co-location services for equipment in the LFC's premises are not a part of the Specified Layer 1 Service and can be covered by separate charges.

Network Topology

34. CFH is open to proposals based on Passive Optical Network (**PON**), topologies or Active Optical Network (**AON**) topologies or a mix of PON and AON, providing the Network is architected to meet or exceed the bandwidth requirements set out in paragraph 25. One example of an AON topology is a Point to Point network.
35. In a mixed PON/AON network, differential pricing is permitted, but only to the extent that it reflects actual cost differentials between network topologies.

Service Provider to Choose Terminal Equipment

36. It is up to the Access Seeker to choose suitable MUX and ONUs to connect to the LFC's AON-based Specified Layer 1 Service and/or suitable OLTs and ONUs to connect to the LFC's PON-based Specified Layer 1 Service (as applicable).

Operational Standards

37. Operational standards, for example provisioning and restoration response times, are to meet industry best practice as specified in the Layer 1 Service Description under development by CFH with the Telecommunications Carriers' Forum.

Specific Requirements for the Specified Layer 1 Service over a Passive Optical Network

Standards

38. Any PON-based networks must, at a minimum, support the Layer 1 requirements of GPON (ITU-T G.984).

Splitter ratios

39. The Splitter ratio adopted must be consistent with meeting or exceeding the Layer 2 download/upload requirements identified in paragraph 25.

Support for point-to-point links

40. If a PON is chosen, the LFC must still provide for point-to-point connections to any Priority Users and other connections of demand (such as cell sites) within the PON Coverage Area.

Meeting Access Seeker requirements

41. A key element of a passive design is its ability to support a competitive market. To this end, the passive architecture must provide for Access Seekers, and enable each Access Seeker to connect their own OLT's where these are required.
42. The effectiveness of the measures proposed by Respondents will be included in CFH's assessment of the competitive benefits of their Proposals.

4. THE SPECIFIED LAYER 2 SERVICE

Statement of Principles

43. The requirements set out here for the Specified Layer 2 Services should best be viewed as a statement of principles rather than as a final statement of the specification.
44. CFH expects to finalise a detailed specification for the Specified Layer 2 Services (Ethernet) as part of an industry-wide consultation process managed through the TCF.
45. There is likely to be a requirement to support an RF overlay solution for the delivery of TV broadcast services over fibre, utilising the 1550nm wavelength to support RF Video. The Layer 1 and Layer 2 principles for this have yet to be determined.

Specified Layer 2 Services

46. The LFC must, at minimum, offer the Specified Layer 2 Services outlined in this section.
47. The LFC is able, with CFH's consent, to offer other Layer 2 Services in addition to the Specified Layer 2 Service.

Multiple Service Providers

48. The most significant requirement for the Specified Layer 2 Services is that it must enable multiple Service Providers to deliver services to an individual End User directly.

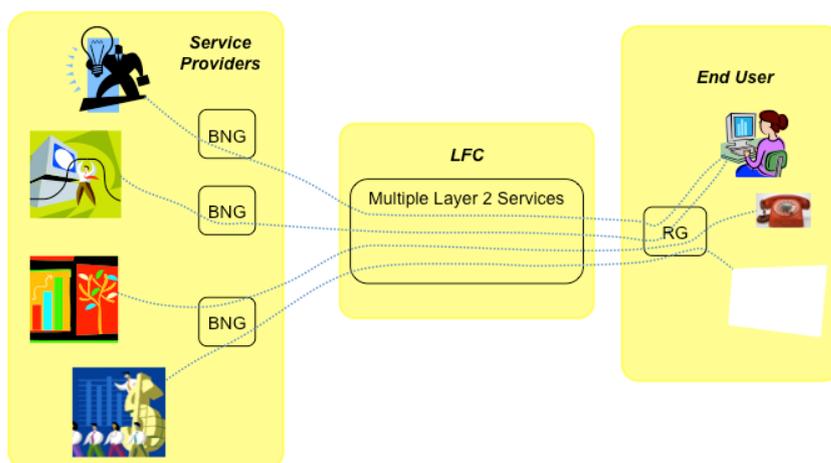


Figure 1 - Multiple Service Providers for each End User

49. Figure 1 illustrates this requirement. Four Service Providers are shown, with the top two each having a physically separate Broadband Network Gateway (BNG) interface and the lower two adopting a commercial arrangement in which they share a single BNG for access to the LFC's Layer 2 Service.
50. It is not intended to stipulate any particular requirement for Service Provider equipment configuration, other than compliance with interface standards which are discussed throughout this specification, for access to the Layer 2 Service.
51. A Residential Gateway (RG) is also shown as the primary point of access to the Layer 2 Services for the End User's equipment (a computer, telephone, and television in this illustration). This specification presents requirements specific to the interface between the Layer 2 Service equipment and the End User's equipment, which provides some restriction to equipment configuration (e.g. RG configuration). These restrictions are highlighted in a later section.
52. The LFC and the Service Providers are free to negotiate different sets of parameters for governing how the Layer 2 Service will manage delivery of data traffic to and from End User equipment.
53. Service Providers will purchase Layer 2 Service options with agreed data traffic performance characteristics that suit the type of service purchased by the End User. It is expected that LFCs will offer attractive "packages" of data traffic performance parameters that suit all Service Provider requirements.

The Specified Layer 2 Services over an Active Optical Network

54. Layer 2 Services based on an AON network can provide very high symmetrical bandwidth between Service Providers and End Users (much higher than those that can be provided using Gigabit Passive Optical Network (GPON). This allows End Users to purchase very high bandwidth services, as well as for Service Providers to offer configurations for multi-tenant buildings in which individually connected End Users enjoy bandwidths as high as (or superior to) those provided across GPON.
55. The minimum scope for the Specified Layer 2 Services utilising an AON and a Point to Point network is shown in the following figures

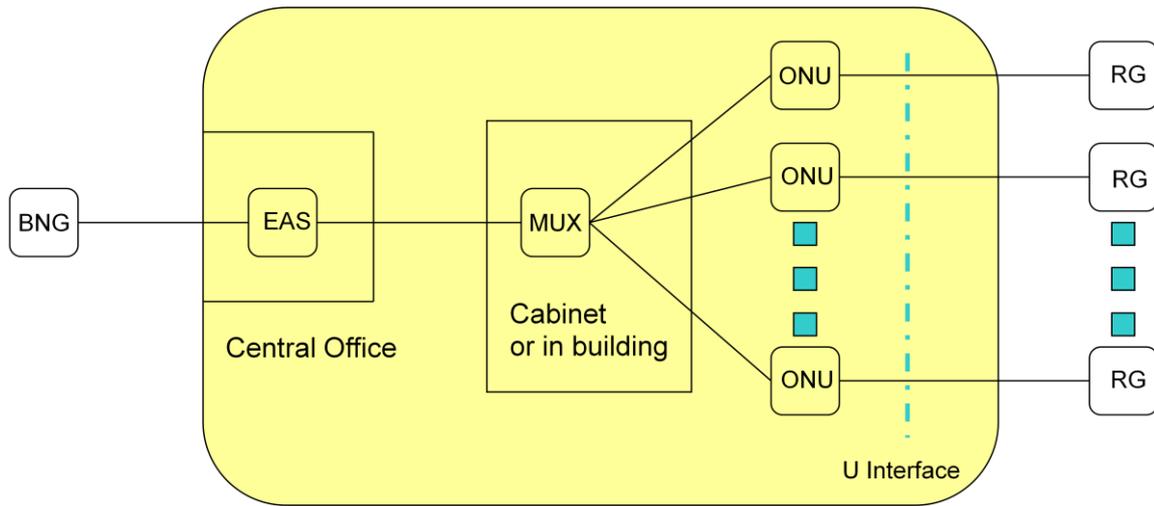


Figure 2 - Minimum scope for the Specified Layer 2 Services over an AON

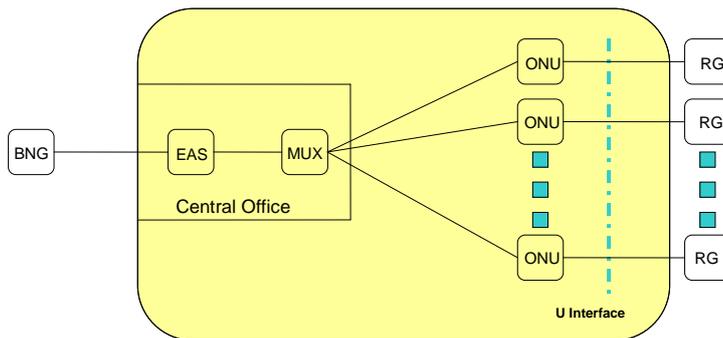


Figure 3 - Minimum scope for the Specified Layer 2 Services over a Point to Point Network

- 56. This architecture is compliant with the TR-101 standards and provides an end-to-end IEEE 802.3 Ethernet path between the Service Provider and End User equipment.
- 57. In this case, the BNG and RG components are outside the scope of the LFC business.
- 58. The ONU must provide a TR-101 U Interface compliant with the IEEE 802.1ad standard in such a way that S-VLAN-ID, C-VLAN-ID, and P-Bit assignments can be used to deliver multiple Service

Provider services to a single End User according to the data traffic performance characteristics associated with the Layer 2 Service option purchased by each Service Provider. It is outside the scope of this specification to determine an industry-wide standard for management of the IEEE 802.1ad name space in this context.

59. The Ethernet Aggregation Switch (EAS) must also provide an IEEE 802.1ad compliant interface to BNGs (or other similarly deployed equipment) for connectivity to Service Providers.
60. It is noted that the required interface point at the EAS for connectivity between Service Providers and the LFC business is very similar to the IEEE 802.1ad compliant interface that exists for today's regulated Enhanced Unbundled Bitstream Access (EUBA) service. It is likely that the yet-to-be-agreed industry wide standard for management of the IEEE 802.1ad name space may provide subtle modifications to that agreed for EUBA today. LFCs and Service Providers will therefore be well prepared for implementation of new name space conventions.
61. Note also that the ONU must provide at least four physical Ethernet ports for connection to the RG (see the paragraphs later in this Appendix on the point of delivery requirements for the Specified Layer 2 Service).

Implementing the Specified Layer 2 Services to a multi-tenant building under AON

62. Under an AON network architecture, the LFC is permitted to implement the Specified Layer 2 Services to a multi-tenant building using a single ONU with multiple physical ports, where each End User of the Specified Layer 2 Services is connected to an individual port on the ONU.
63. Under an AON / P2P network architecture, the LFC is permitted to implement the Specified Layer 2 Services to a multi-tenant building using a single ONU with multiple physical ports, where each End User of the Specified Layer 2 Services is connected to an individual port on the ONU.

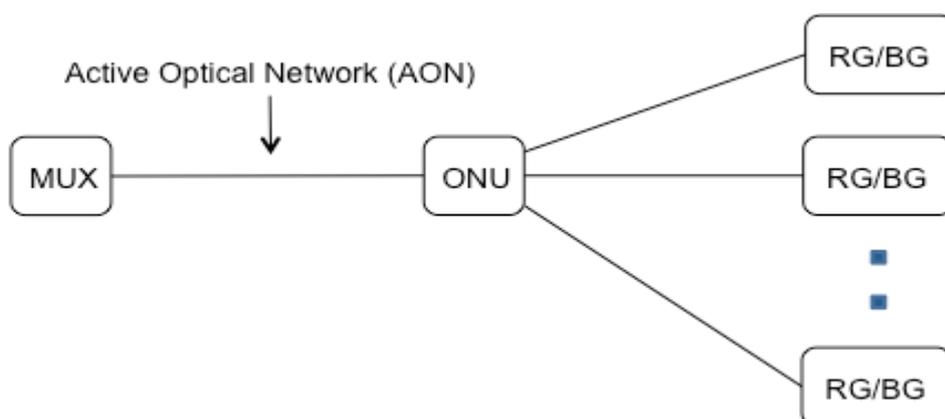


Figure 4 - The ONU in a multi-tenant building can support multiple physical ports

64. Each individual Ethernet port on the ONU must be compliant with the 100Base-T or 1000Base-T Gigabit Ethernet capability.

The Specified Layer 2 Services over a Passive Optical Network

65. The Specified Layer 2 Services based on a PON network must, at a minimum, be based on the Gigabit Passive Optical Network (GPON) standard set out in ITU G.984, and should also be able to readily accommodate future iterations of this standard.

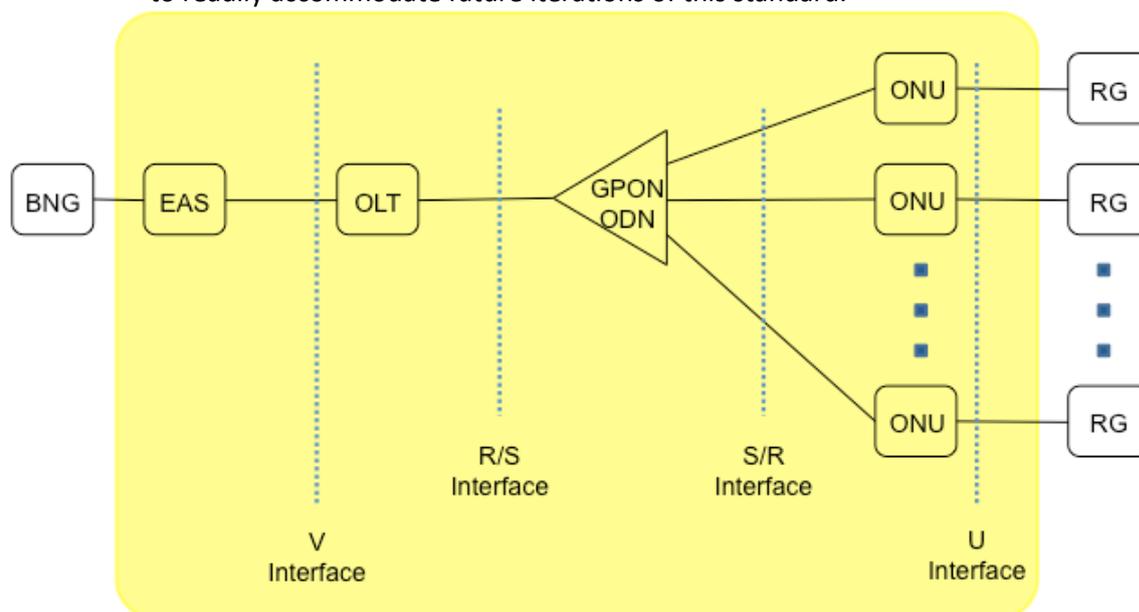


Figure 5 - Minimum scope for the Specified Layer 2 Services over a PON

66. Figure 4 shows the minimum scope for a basic Layer 2 Service infrastructure utilising a GPON Optical Distribution Network (ODN) for provision of Service Provider service offerings to large numbers of End Users. This architecture is compliant with the TR-101 and TR-156 standards and provides an end to end IEEE 802.3 Ethernet path between the Service Provider and End User equipment.
67. The V and U Interfaces must comply with the IEEE 802.1ad standard in such a way that S-VLAN-ID, C-VLAN-ID, and P-Bit assignments can be used to deliver multiple Service Provider services to a single End User according to the data traffic performance characteristics associated with the Layer 2 service option purchased by each Service Provider. It is outside the scope of this specification to determine an industry wide standard for management of the IEEE 802.1ad name space in this context.

68. The OLT and ONU must comply with the TR-156 standard for the mapping of the IEEE 802.1ad S_VLAN_ID, C_VLAN_ID, and P-bit assignments to GPON Encapsulation Method (GEM) Port transport/convergence facilities across the R/S and S/R interfaces.
69. Note also that the ONU must provide at least four physical Ethernet ports for connection to the devices at the End User's premises (see the paragraphs later in this document on the point of delivery requirements for the Specified Layer 2 Service).
70. In the context of this specification, the requirements for provision of a Layer 2 Service across a GPON configuration are effectively the same as those pertaining to Layer 2 Services provided across AON / P2P. The same Layer 2 Service requirements exist at the U Interface as for the AON / P2P architecture, as well as at the interface point between Service Providers and the LFC (using an EAS) although there may be additional and/or differing equipment deployed within the boundaries of the LFC business. For example GPON introduces OLTs whilst AON uses an appropriate type of MUX for aggregation of large numbers of ONUs to one or more EASs.

Implementing the Specified Layer 2 Services to a multi-tenant building under PON

71. Under a point-to-multipoint network architecture the LFC is permitted to implement the Specified Layer 2 Services to a multi-tenant building by locating splitters in the multi-tenant building itself, provided that the LFC ensures that there is appropriate support for any point to point connections to any Priority Users and other concentrations of demand within the multi-tenant building.

Point of Delivery Requirements

U interface is the point of delivery

72. The U interface which sits between the ONU and the RG/BG, is the point of delivery of Layer 2 Services to End Users.

U interface must support the 802.1ad standard in both BGs and RGs

73. The U Interface towards BGs must support the IEEE 802.1ad standard.
74. It is noted that TR-101 and TR-156 discuss two types of "gateway" – the RG and the BG. In the context of this specification the most significant differentiator is that these standards state that RGs must support the IEEE 802.1Q standard for single VLAN-ID tagging and P-Bit processing, whilst BGs must support the IEEE 802.1ad standard. Neither standard (currently) states that RGs must support the IEEE 802.1ad standard.
75. However, industry and standards trends are toward stipulation of a requirement for RGs to comply with the IEEE 802.1ad standard. BGs compliant with IEEE 802.1ad have been on the market for quite some time, and RG manufacturers are already selling RGs that are IEEE 802.1ad compliant.

76. The U Interface towards RGs must support the IEEE 802.1Q standard. LFCs are expected to transition to an ONU with an IEEE 802.1ad compatible U Interface towards RGs when they become more widely available. Details of such a transition will need to be coordinated with Retail Service Providers.

ONU must be separate from BG and RG

77. TR-156 provides options for equipment that delivers the ONU and RG/BG functions, where this equipment could be provided:
- a. using physically separate units (e.g. an ONU connected via 1000Base-T or 100Base-T Ethernet cable to the RG/BG); or
 - b. combined into a single unit such that the U interface is internalised and potentially non-existent.
78. The ONU provides the U Interface with the RG and BG and thus part of the Layer 2 Service within the scope of the LFC business, while the RGs and BGs are not. So the combined option is not allowed.

Port interfaces on the ONU

79. The ONU must provide at least four Ethernet port interfaces, and may also provide at least two voice service port interfaces.
80. The Ethernet port interfaces on the ONU must support:
- a. the IEEE 802.1Q standard at the U Interface with the RG for the mass market ; and
 - b. the IEEE 802.1ad standard at the U Interface with the BG for the business market; and
 - c. 1000Base-T Gigabit Ethernet connection.
81. If the ONU is connected to an RG or BG which supports a lower speed standard (such as 100Base-T Ethernet) then the ONU must automatically “step down” and synchronise to the speed supported by the RG/BG
82. The ONU should also support an interface for the delivery of broadcast television over RF, although the decision on whether to provide this broadcast service has yet to be made. The RF output from the ONU is to be provided on an “F” type coaxial connector.
83. The RG/BG must comply with the IEEE 802.1q standard or the IEEE 802.1ad standard as described above, and is responsible for ensuring that data traffic from the ONU (delivered by one or more Layer 2 Service instances) is directed toward the appropriate End User equipment.

84. Additionally, the RG/BG is responsible for ensuring that traffic from End User equipment is delivered to the ONU using S-VLAN-ID, C-VLAN-ID, and P-Bit assignments that map the traffic into the appropriate Layer 2 Service instances.
85. Practical examples of such an intermediary device include BGs, Ethernet Switches, and RGs that are compliant with the IEEE 802.1ad standard. These are all capable of being configured to play some type of Intermediary Device role.
86. To be clear, this specification does not state any particular cabling requirements within the End User's premises beyond provision of an interface port on the ONU supporting 1000Base-T, and for RF service over coaxial cable. This does not mean that Service Providers are required to provide cabling and RG/BGs that also support 1000Base-T Gigabit Ethernet connectivity.

14.1 Provider Bridges

87. There are special technical considerations for the LFC Network infrastructure in support of End User equipment connection to the services provided by Service Providers. These considerations are specific to Layer 2 Service provision – they do not apply to Layer 1 Service products.
88. There are two special considerations for the Layer 2 Service:
 - a. At the time a Service Provider purchases a Layer 2 Service, the business transaction must agree values for the S-VLAN-ID, C-VLAN-ID, and P-Bits that are to be used for identification and management of the Layer 2 Service instance. In support of secure End User authentication by the Service Provider, it is likely that some form of Service Identifier is agreed, which can be linked in some way to the End User location. Additionally, some form of Handover Point Identifier is likely to be required to identify the LFC equipment/port to which the Service Provider equipment is connected.
 - b. At the time the End User's RG is powered on, it will complete a cycle of start-up procedures that include establishing the Layer 2 Service connections, and obtaining an IP address (or possibly more than one) from the Network. In an IEEE 802.1ad context, there are a number of implementation choices to be made by RG manufacturers within the standards frameworks for management of these activities. The LFC's equipment will have a part to play in support of the end-to-end flow of data traffic in support of this.
89. Satisfaction of these considerations is outside the scope of this specification, and must be agreed at industry level.
90. Service Providers are free to agree equipment configuration and management practices on the End User side of the U Interface as they see fit, within these constraints.

14.2 Data Traffic Performance Parameters

91. It is expected that LFCs will offer attractive “packages” of data traffic performance parameters that suit all Service Provider requirements through an appropriately sized set of Layer 2 Service purchase options.

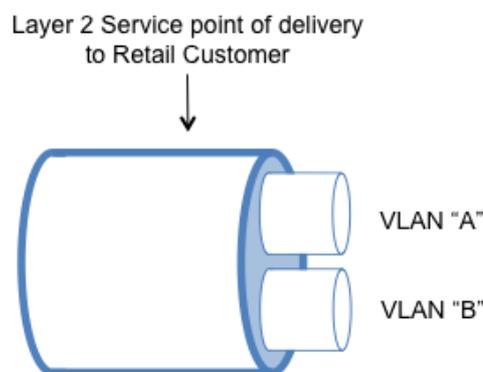


Figure 7 - Basic VLAN traffic separation

92. Figure 7 illustrates a basic Layer 2 Service configuration in which an End User has two VLANs providing services to their equipment (this means two Layer 2 Services – one for each VLAN).
93. Note that the fact that there are two VLANs in this illustration does not mean that there must be two Service Providers. LFCs are free to negotiate with Service Providers as they see fit, and Service Providers are free to negotiate with each other for service aggregation as they see fit. In this illustration, the End User has entered into a purchase agreement with at least one (and possibly two or more) Service Providers who, in turn, have purchased two instances of the Specified Layer 2 Services for delivery of services to the End User’s equipment.
94. There are two options around traffic prioritisation and shaping for these VLANs:
- a. VLAN “A” and VLAN “B” may have equal performance commitments (essentially provided using the same Layer 2 Service option); or
 - b. VLAN “A” and VLAN “B” may have differing performance commitments (essentially provided using two Layer 2 Service options).
95. These two VLANs must be identified and managed using industry name space conventions for S-VLAN-ID, C-VLAN-ID, and P-Bit assignments which are outside the scope of this specification.
96. It is expected that LFCs and Service Providers, through a process of industry consultation managed through the Telecommunications Carriers’ Forum will agree performance commitments based on the usual attributes such as Class of Service (COS), Peak Information

Rate (PIR), Committed Information Rate (CIR), jitter, latency, and rules around discarding data packets when traffic flows exceed the boundaries of these performance commitments. The current working assumptions regarding performance commitments for CIR are as follows:

High Priority Class of Service (CIR bandwidth); Discard Ineligible; Frame Delay < 5ms; Frame Delay Variation < 1ms; Frame Loss Ratio < 0.01%.

97. In particular, Service Providers are required to shape ingress data traffic to match these performance parameters to avoid unwanted discard of data packets by the LFC's Layer 2 Service equipment.
98. To be clear, the LFC is required to "police" data traffic flows according to the agreed performance commitments – this means that the LFC is required to discard data packets from Service Providers that fall outside the boundaries of the agreed performance commitments.
99. LFCs must report on Layer 2 Service capacities available to individual End Users to enable Service Providers to understand (prior to purchase by the End User) whether or not their retail service offering can be delivered effectively. In other words the LFC has a responsibility to aid in the assessment of Layer 2 Service delivery capabilities against prospective purchase decisions by Service Providers – it is not appropriate for an additional Layer 2 Service instance to be agreed for delivery to an End User if doing so is likely to destroy or otherwise negatively impact existing Layer 2 Service instances.
100. Whilst this section discusses the situation with two VLANs delivered by two Layer 2 Service instances, the upper limit on the number of VLANs (and hence number of Layer 2 Service instances) that can be provided to an individual End User is, in practice, limited to the number of Layer 2 Service instances that can be delivered without destroying or otherwise negatively impacting each other (i.e. it is a function of avoiding conflict between combinations of differing PIR, CIR, jitter, and latency parameters).
101. Emphasis is placed on the requirement for the LFC to provide one or more Layer 2 Service options that allow Service Providers to manage their own traffic prioritisation schemes (using P-Bits in the C-VLAN-ID) as they see fit (this prioritisation must take place within the boundaries of the agreed performance parameters of the associated Layer 2 Service option).
102. To be clear, this does not mean that LFCs cannot themselves use P-Bits within the C-VLAN-ID for management of Layer 2 Services – the details around this will form part of an industry agreement around usage of the IEEE 802.1ad S-VLAN-ID, C-VLAN-ID, and P-Bit name space conventions.

14.3 Multicast Traffic

103. The Specified Layer 2 Services must provide multicast traffic management facilities for services deployed across either GPON or AON.

104. This allows Service Providers to offer services of a “broadcast” or “one-to-many” nature suitable for efficient transport using multicast facilities.

5. RF OVERLAY TRANSMISSION OF BROADCAST TELEVISION

105. To be developed further
106. There is likely to be a requirement to support an RF overlay solution for the delivery of TV broadcast services over fibre, utilising the 1550nm wavelength to support RF Video. The Layer 1 and Layer 2 principles for this have yet to be determined.
107. In order to support RF overlay, the ONU must cater for an RF Coax port.
108. The LFC’s architecture must not prevent the deployment of a future RF overlay if it is not provided at the outset.

6. INTERCONNECTION REQUIREMENTS

Intra-Candidate Area backhaul

109. The LFC will provide intra Candidate Area backhaul between Central Offices and points of interconnection for Layer 2 services. Passive infrastructure used to provide such backhaul will be considered to be communal infrastructure.

Interconnection

110. The LFC is required to provide, direct connection to neutral points of interconnection within the Candidate Area. That said, CFH notes that since any neutral point of interconnection represents a premises in the LFC’s Coverage Area the LFC should inevitably provide fibre to that premises.

7. Reliability Requirements

111. Refer to Schedule 5 paragraph 30 onwards.
112. It is expected that there will be a cohesive OSS/BSS architecture developed to provide a consistent interface between Retail Service Providers and LFCs.
113. It is further expected that LFCs will allow for EOI (Equivalence of Input) interfaces between Layer 1 and Layer 2 in order to allow for an easy transition to EOI if required.
114. All equipment is to be manageable through industry standard interfaces (e.g. the ONU should be managed through Broadband Forum TR069).
115. Access to functionality exposed to LFCs is expected to be provided through business-to-business (B2B) gateways.

8. DEFINITIONS

116. The terms used in this Appendix 3 shall have the following meanings. Where a capitalised term is used in this Appendix 3 which is not defined below, it has the meaning defined in the main body of the ITP.

Term	Definition
AON	Active Optical Network – a general term that describes any network configuration in which Multiplexors (MUXs), either in a Central Office or a cabinet are used to connect multiple Optical Network Units (ONUs) via dark fibres. A Point to Point network is an AON with an emphasis on direct connection to each ONU, in which case each dark fibre provides a direct point-to-point physical connection between the MUX in a Central Office and each ONU.
BG	Business Gateway – a more sophisticated form of the Residential Gateway (RG) which is described below. BGs contain extra features and often have more physical connection points, which make them more suitable to some businesses than a standard RG.
BNG	Broadband Network Gateway – a general term for a piece of network equipment that terminates Layer 2 Services at the Service Provider part of the Network. BNGs provide Service Providers with mechanisms for management of data traffic on a per End User basis. They are described in more detail in the TR-101 standard.
Central Office	The termination point for the LFC’s Network. The Central Office is where the OLTs and/or MUXs (as applicable) are installed. Central Offices are expected to connect to at least several thousand End User premises.
C-VLAN-ID	Customer VLAN Identifier – defined in the IEEE 802.1ad standard, and applied for separation of data traffic from the perspective of an individual customer (e.g. an End User).
EAS	Ethernet Aggregation Switch – a specialised piece of network equipment used to aggregate data traffic to/from many Multiplexors (MUXs) or Optical Line Terminals (OLTs). EASs provide a connection mechanism to Broadband Network Gateways (BNGs).

Term	Definition
Ethernet	Described by the IEEE 802.3 standards, “Ethernet” is a particular style of data traffic management and formatting for Layer 2 Services, and is increasingly being established as the dominant Layer 2 Service technology throughout the world.
EUBA	Enhanced Unbundled Bitstream Service – a regulated Layer 2 Service in the New Zealand market today.
GEM	GPON Encapsulation Method – a mechanism for the management of data traffic transport between multiple Optical Network Units (ONUs) and an Optical Line Terminal (OLT) in a GPON network configuration.
GPON	Gigabit Passive Optical Network – a specific standard for connection of Optical Line Terminals (OLTs) to multiple Optical Network Units (ONUs) in which groups of ONUs are connected to an OLT using a shared dark fibre configuration. This is described in the ITU-T G.984 standard.
GPON Splitter	A specialised piece of network equipment that connects a single dark fibre from one side to many dark fibres on the other. It is used in the GPON network configuration to allow many Optical Network Units (ONUs) to share a single port on an Optical Line terminal (OLT) – hence the use of the word “Splitter” – splitting one dark fibre into many.
Handover Point Identifier	An as-yet-to-be-determined information tag than can be used for identifying a physical network point at which the LFC’s Layer 2 Service is “connected” to the network equipment that is owned and operated by a Service Provider.
LC APC type connector	A small form factor fibre connector installed on the ends of dark fibre cable for use in high density situations, typically on racks of equipment. The term APC refers to the fact that the ends of the fibres are angled to ensure any reflections from the interfacing surfaces are not reflected back into the fibre.
MUX	Multiplexor – a general term used to describe a piece of network equipment that terminates many dark fibres in an Active Optical Network (AON) configuration, and is installed in centralised locations within the LFC business.

Term	Definition
ODN	Optical Distribution Network – a general term for the specialised dark fibre configuration of a GPON network in which many ONUs share a single dark fibre for connection to an OLT. This is described in the ITU-T G.984 standard.
OLT	Optical Line Terminal – a general term for a specialised piece of GPON network equipment that terminates many dark fibres and is installed in centralised locations within the LFC Network. An OLT terminates the dark fibres from many Optical Network Units (ONUs), and is described in more detail in the TR-156 standard.
ONU	Optical Network Unit – a general term for a specialised piece of network equipment that terminates a single dark fibre and is located at the End User premises (described in more detail in the TR-156 standard).
P-bit	Priority bit(s) – a data traffic priority value between 0 and 7 set in the 3-bit tag field of the C-VLAN-ID and/or S-VLAN-ID fields (both of these fields can carry P-bit values).
RG	Residential Gateway – a mass produced piece of network equipment (often referred to as “the customer’s modem”) which sits in the home or office, connects to the Layer 2 Service on one side, and to the End User’s equipment (PCs, telephones, etc) on the other. This is described in more detail in the TR-101 standards.
R/S Interface	A specific standard interface point described in the ITU-T G.984 standard for GPON.
S/R Interface	A specific standard interface point described in the ITU-T G.984 standard for GPON.
SC APC type connector	A special type of connector installed on the ends of a dark fibre cable. SC type connectors provide a very easy “set and click” style of operation for pushing a dark fibre into/out-of network equipment. The term APC refers to the fact that the ends of the fibres are angled to ensure any reflections from the interfacing surfaces are not reflected back into the fibre.
S-VLAN-ID	Service VLAN Identifier – defined in the IEEE 802.1ad standard, and applied for separation of data traffic from the perspective of a service provider (e.g. a Service Provider).

Term	Definition
U Interface	A point between an Optical Network Unit (ONU) and a Residential/Business Gateway (RG/BG) at which a set of interface standards are applied (including the IEEE 802.1ad standard). The U Interface is described in the TR-101 standard.
V Interface	A point between a Multiplexor/Optical Line terminal (MUX/OLT) and an Ethernet Aggregation Switch (EAS) at which a set of interface standards are applied (including the IEEE 802.1ad standard). The V Interface is described in the TR-101 standard.

**APPENDIX 4A
NON-DISCRIMINATION**

A. INTRODUCTION

1. Each LFC is required to meet the non-discrimination requirements set out in this Appendix 4A during the Initial Period.
2. The non-discrimination requirements will be implemented through a Deed of Undertaking made by the LFC to the government. Note that detailed undertakings have not been developed at this stage. The final shape of the undertakings will be finalised after negotiations with Shortlisted Respondents. The Deed will be enforced by the Commerce Commission (and CFH will have the ability to impose penalties or equivalent financial consequences via its contractual arrangements with LFCs and Partners).
3. Respondents must include in their Proposals all key elements of the approach they propose to adopt to ensure that the non-discrimination requirements in this part of the Appendix will be met by the LFC.

B. NON-DISCRIMINATION REQUIREMENTS

4. From the commencement of LFC services until 31 December 2019, the LFC must:
 - (a) provide point-to-point Layer 1 Services on non-discriminatory terms to all Access Seekers;
 - (b) provide the Specified Layer 2 Services on non-discriminatory terms to all Access Seekers; and
 - (c) provide all other Layer 1 and Layer 2 Services on non-discriminatory terms to all Access Seekers; and
 - (d) design and implement the LFC's Network and operational systems (OSS/BSS) in a way that is capable of providing Layer 1 Services and Layer 2 Services on an equivalent basis by 31 December 2019.
5. Non-discrimination is a measure intended to ensure that the LFC does not give itself an unfair advantage when both the LFC and its Access Seeker customers compete in the marketplace for the provision of Layer 2 Services. It is also a means of ensuring that supply of Layer 2 Services to the Partner does not favour the Partner's downstream retail arm (if any), and undermine the limitation on the LFC's participation in the retail market.
6. Non-discrimination ensures that like Access Seekers are treated in a like manner, and that any differences are objectively justifiable, reasonable and transparent. For example, the differences in treatment may be justifiable by differences in costs, the Access Seeker's needs or the Access Seeker's characteristics. However, even where these tests have been met, any differences in treatment should not harm competition.
7. As a minimum, the undertakings would be likely to include provisions that relate to:
 - *Arm's Length Dealings with the Partner* - The LFC will deal with the Partner on arm's length terms. Arm's length terms means that the relationships between the parties do not include elements that the parties would usually omit, and do not omit elements that the parties would usually include, if the parties were acting independently.

- *Standard Terms* - The LFC will maximise the use of standard terms for all commercial arrangements, and any non-standard terms will be non-discriminatory.
- *Confidential Information* - The LFC will not disclose confidential information relating to its external Access Seekers to related parties or its own staff responsible for marketing Layer 2 Services to other Access Seekers.
- *Access to information* - The LFC's Access Seekers will all have the same access to information from the LFC.

**APPENDIX 4B
EQUIVALENCE AND NON-DISCRIMINATION**

A. INTRODUCTION

1. Each LFC is required to meet the equivalence and non-discrimination requirements set out in this Appendix 4B during the Subsequent Period.
2. The non-discrimination requirements will be implemented through a Deed of Undertaking made by the LFC to the Government. Note that detailed undertakings have not been developed at this stage. The final shape of the undertakings will be finalised after negotiations with Shortlisted Respondents. The Deed will be enforced by the Commerce Commission (and CFH will have the ability to impose penalties or equivalent financial consequences via its contractual arrangements with LFCs and Partners).
3. Respondents must include in their Proposals all key elements of the approach they propose to adopt to ensure that the equivalence and non-discrimination requirements in this part of the Appendix will be met by the LFC.

B. EQUIVALENCE AND NON-DISCRIMINATION REQUIREMENTS

4. By 1 January 2020, the LFC must:
 - (a) have implemented its Network and operational systems in a way that is capable of providing Layer 1 Services on an equivalent basis;
 - (b) provide unbundled Layer 1 Services on all parts of its Network including the point-to-multipoint parts of its Network;
 - (c) provide all Layer 1 Services (including unbundled Layer 1 Services) to itself and to all other Access Seekers on equivalent and non-discriminatory terms; and
 - (d) provide the Specified Layer 2 Services, and all other Layer 2 Services on non-discriminatory terms to all Access Seekers.
5. The standard of equivalence will be “equivalence of inputs” (**EOI**), meaning the LFC must offer the same service at the same price and using the same operational processes to all Access Seekers, including itself.
6. EOI is intended to provide an assurance that all Access Seekers receive the same products and services on the same terms. It is a measure to ensure that the LFC does not give itself an unfair advantage (whether explicit or implicit, direct or indirect) when both the LFC and its Access Seeker customers compete in the marketplace for the provision of Layer 2 Services.
7. A Respondent could meet the equivalence and non-discrimination requirements by agreeing to the LFC structuring and operating on the basis of:
 - *Operational Transparency* – The LFC will provide Layer 1 Services but Layer 2 Services will be provided through an approach which ensures full transparency on a basis to be agreed.

- *Arm's Length Dealings* – The LFC will deal with the Partner on arm's length terms, and the LFC and the Layer 2 business will deal with each other on arm's length terms. Arm's length terms means that the relationships between the parties do not include elements that the parties would usually omit, and do not omit elements that the parties would usually include, if the parties were acting independently.
 - *Product* – The LFC will offer the same Layer 1 Services at the same price to all Access Seekers, including the Layer 2 business unit.
 - *Operational Processes* – The LFC will deliver the Layer 1 Services using the same operational processes for all customers and the Layer 2 business will deliver the Layer 2 Services using the same operational processes for all Access Seekers.
 - *Standard Terms* – The LFC and the Layer 2 business unit will maximise the use of standard terms for all commercial arrangements, and any non-standard terms will be non-discriminatory.
 - *Confidential Information* – The LFC will not disclose confidential information relating to its external Access Seekers to the Layer 2 business.
 - *Access to Information* – The LFC's external Access Seekers will have the same access to information and the same ability to influence the LFC's plans as the Layer 2 business does.
 - *Transparency* – The LFC and the Layer 2 business will disclose to the Commerce Commission and CFH all financial and non-financial information reasonably necessary to demonstrate compliance with these requirements.
8. There will be penalties, liquidated damages, or other such similar financial consequences applying to any LFCs that have not complied with paragraph 6 of this Appendix 4B by 1 January 2020.