

Tuatahi First Fibre Services Agreement

Service Description

Bitstream 4

Version 1.0.1

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General

1 Interpretation

- 1.1 The Bitstream 4 Service described in this Service Description will be available from the date it is launched by the LFC. The LFC will notify the Service Provider of the launch date for the Bitstream 4 Service.
- 1.2 References to clauses or sections are references to clauses or sections in this Service Description unless expressly provided otherwise. The definitions set out in the General Terms and the Operations Manual apply to this Service Description unless expressly provided otherwise.
- 1.3 References to the Operations Manual are references to the operations manual for the Bitstream Services.

2 The Bitstream 4 Service

- 2.1 The Bitstream 4 Service is a high speed single-class Bitstream Services suitable for complex business grade applications and premium residential products delivered over a shared fibre access. The Bitstream 4 Service is part of the family of Bitstream Services set out below:

Bitstream 2	Based on the TCF Mass Market service.
Bitstream 2 Ultra	Based on the TCF Mass Market service.
Bitstream 3	Based on the TCF Business service.
Bitstream 3a	Based on the TCF Business service, with Low Priority options.
Bitstream 3b	Based on the TCF Business service, with Low Priority options
Bitstream 4	Based on the TCF Business Premium service.
Handover Connection	Based on the TCF E-NNI specification.
Multicast	Based on the TCF Ethernet Multicast Access (EMA) service.
ATA Voice	An analogue telephone access service.

- 2.2 A diagram of the configuration for the Bitstream 4 Service is set out in Appendix A. The Bitstream 4 Service provides an Ethernet A-EPL Bitstream Service from the NID at:
 - 2.2.1 Inside the End User Premises (or End User Tenancy in the case of an MDU); or
 - 2.2.2 the Service Provider's Co-location Footprint at a Central Office (as described in clause 3.1.1)to a Handover Connection Service located at the POI or (using a Tail Extension) another handover point that enables a Service Provider to access and interconnect with the LFC Network.
- 2.3 The Bitstream 4 Service is an input service which a Service Provider can combine with other LFC services (or with the Service Provider's own network or wholesale services provided by other Service Providers) to provide fibre based telecommunications services to End Users.
- 2.4 The Bitstream 4 Service has the following key characteristics:

- 2.4.1 An Ethernet A-EPL Bitstream Services delivered over Active Optical Network (P2P) fibre that allows up to 4050 VLANs to be passed transparently from the End User Premises to the Service Provider's co-location space to the Service Provider's Handover Connection at the POI.
- 2.4.2 A range of standard service plans are offered.
- 2.4.3 Supports tagged or untagged traffic by the End User.
- 2.4.4 Can be delivered to a commercial Shared Handover Connection at the POI of (using a Tail Extension) another handover point.
- 2.4.5 Complies with the Mass Market service specified in the *TCF Ethernet Access Service Description v33, 11 May 2017*.

3 Bitstream 4 Service and implementation activities

Installation Services

- 3.1 The Bitstream 4 Service includes a Standard Install as set out below (in each case to the extent that the relevant provisioning works are not already complete for the relevant Service Order).

Connection to Co-Location Space

- 3.1.1 If the Service Provider elects to take delivery of the Bitstream 4 Service at the Service Provider's Co-location Footprint taken pursuant to the Central Office and POI Co-location Service, a Standard Install includes connection of the Bitstream 4 Service to an LFC NID (if required) installed in the Service Provider's Co-location Footprint.

Provisioning at Single Dwelling Unit End User's Premises

- 3.1.2 A Standard Install for the Bitstream 4 Service to a Single Dwelling Unit includes:
 - (a) A Fibre Lead-in from the Fibre Access Point to an ETP at the closest convenient point on the End User Premises, as agreed with End User, where the Fibre Lead-in utilises no more than:
 - (i) 100m of approved conduit or open trench (already in place at the time of installation); or
 - (ii) a double span of aerial drop lead on existing poles from the Fibre Access Point (this will include road crossings and is available only in areas where there is overhead deployment); or
 - (iii) 30m of buried lead-in (available only in areas where there is underground deployment); and
 - (b) An extension of the Fibre Lead-in up to 10m radius from the ETP (there will not necessarily be a break in the Fibre Lead-in at the ETP) to:
 - (i) a suitable mounted SC/APC connector at a secure location inside the End User Premises; or
 - (ii) if there is an OFDF beyond the ETP, a splice or LCA connector on the OFDF.
- 3.1.3 The LFC will provide Non-Standard Installs for the Bitstream 4 Service to Single Dwelling Units as an Ancillary Service.

Provisioning at MDU End User's Premises

- 3.1.4 A Standard Install for the Bitstream 4 Service to an End User that is within a MDU (i.e. an End User Tenancy) includes:

- (a) a Fibre Lead-in from the Fibre Access Point to the OFDF or equivalent at the closest convenient point within the MDU, as agreed with the MDU owner or their agent, where the Fibre Lead-in utilises no more than:
 - (i) 100m of approved conduit or open trench (already in place at the time of installation); or
 - (ii) a double span of aerial drop lead on existing poles from the Fibre Access Point (this will include road crossings and is available only in areas where there is overhead deployment); or
 - (iii) 30m of buried lead-in (available only in areas where there is underground deployment); and
- (b) where the fibre cabling in a MDU to the End User Tenancy is not already in place at the time of installation of the Bitstream 4 Service, fibre cabling within the MDU to extend the Fibre-Lead-in from the OFDF or equivalent to the End-User Tenancy; and
- (c) either:
 - (i) a further extension of the Fibre Lead-in up to 10m radius from the ETP at the End User Tenancy (there will not necessarily be a break in the Fibre Lead-in at the ETP) to:
 - (A) a suitable mounted SC/APC connector at a secure location; or
 - (B) if there is an OFDF beyond the ETP, a splice or LCA connector on the OFDF, within the End User Tenancy; or
 - (ii) if there is not an ETP at the End User Tenancy as contemplated by clause 3.1.4(c)(i), a further extension of the Fibre Lead-in up to 10m radius from the boundary of the End User Tenancy to:
 - (A) a suitable mounted SC/APC connector at a secure location; or
 - (B) if there is an OFDF beyond the boundary, a splice or LCA connector on the OFDF, within the End User Tenancy.

3.1.5 The extended LFC Network fibre within the MDU is the Fibre Lead-in to an End User Tenancy, whether currently in use or not. The Fibre Lead-in is only available for use by the LFC.

3.1.6 The LFC will provide Non-Standard Installs for the Fibre Lead-in to End User Tenancies within MDUs as an Ancillary Service.

Single Dwelling Unit Termination Point

3.1.7 For a Single Dwelling Unit, the termination point of the Layer 1 component of the Bitstream 4 Service for the purposes of the Connection at the End User's Premises, and the network demarcation point between the LFC Network and the Premises wiring is, as applicable, either:

- (a) the SC/APC connector on the end of the Fibre Lead-in from the ETP (which is the connector); or
- (b) if there is an OFDF beyond the ETP, a splice or LCA connector on the OFDF,

provided that any ONT installed by the LFC as part of the Bitstream 4 Service will also be part of the LFC Network.

3.1.8 The termination point of the Layer 2 component of the Bitstream 4 Service is the

100/1000Base-T UNI on the ONT.

- (a) For an RJ45 electrical interface the 100/1000/1GBase-T UNI on the NID; or
- (b) For an optical fibre glass only interface, the 100Base-FX/1000GBase-LX Layer 1 termination point described in clause 3.17.

MDU Termination Point

3.1.9 For MDUs, the termination point of the Layer 1 component of the Bitstream 4 Service for the purposes of the Connection at the End User's Tenancy, and the network demarcation point is as applicable, either:

- (a) the SC/APC connector on the end of the Fibre Lead-in (which is the jack); or
- (b) if there is an OFDF beyond the ETP or End User Tenancy boundary, a splice or LCA connector on the OFDF,

within the End User Tenancy, provided that any NID installed by the LFC as part of the Bitstream 4 Service will also be part of the LFC Network.

3.1.10 The termination point of the Layer 2 component of the Bitstream 4 Service is, as applicable, either:

- (a) For an RJ45 electrical interface the 100/1000Base-T UNI on the NID; or
- (b) For an optical fibre glass only interface, the 100Base-FX/1000GBase-LX Layer 1 termination point described in clause 3.1.9,

Alternative Termination Point

3.1.11 The LFC and the Service Provider may agree on a different termination point as part of a Non-Standard Install. This may be necessary where, for example, there is installation to a NBAP. A Non Standard Install for a Bitstream 4 Service within a Multi Dwelling Unit will not include termination in a building common area or other facility made available by the owner to service the Multi Dwelling Unit, where a Fibre Lead-in has not been extended from the OFDF to the inside of an End User Tenancy.

Installation of NID

3.1.12 A Standard Install for the Bitstream 4 Service with an RJ45 electrical interface includes installation of a NID (some glass only installations may also be require a NID) including:

- (a) supply and fixing of the NID to the structure of the End User Premises (in the case of a Single Dwelling Unit) or an End User Tenancy (in the case of an MDU);
- (b) supply and connection of fibre pigtail up to 1m long between the Fibre Lead-in termination point and the NID if required; and
- (c) testing from the UNI port of the NID to ensure the Bitstream 4 Service is within the technical specification set out in Appendix B.

3.1.13 The LFC will not provide space and power at any End User Premises for the NID. These are the responsibility of the End User. The location of the NID must be a suitable environment for electronic equipment being generally a dry, clean indoor area with adequate ventilation.

Installation of Glass-only

3.1.14 A Service Provider may request installation with an optic interface, i.e. glass-only. The LFC is not obliged to provide this interface but will consider requests on a case by case basis.

- 3.1.15** The Service Provider must ensure the End User provides a suitably located mains power outlet for the ONU power supply which is not provided as part of a Standard Installation.

Testing

- 3.2** The LFC will test the Fibre Lead-in from the termination point at the End User's Premises referred to in clause 3.1.7, 3.1.9 or 3.1.12 to the Central Office where the access node is located to ensure the fibre is within the technical specification for fibre set out in Appendix B.

Additional Services

- 3.3** If the Service Provider requires additional services such as:

- 3.3.1** A Non-Standard Install which includes (where required):

- (a) an extension of the Fibre Lead-in over the maximum distances specified in clauses 3.1.2 (in relation to Single Dwelling Units) or 3.1.4 (in relation to End User Tenancies within MDU's);
- (b) installation to a NBAP utilising specialised termination equipment; or
- (c) installation of Fibre-Lead-in diversity at an End User's Premises (from the FAP to the ETP or OFDF as applicable);

- 3.3.2** Provision of diversity to End User's Premises (when the second or subsequent instance of the Bitstream 4 Service is purchased);

- 3.3.3** Premises wiring services; or

- 3.3.4** Installation and testing of Service Provider equipment and services,

then the LFC may be able to provide the services in clauses 3.3.2 to 3.3.4 on request, subject to terms to be agreed between the LFC and the Service Provider. The services in clause 3.3.1 and 3.3.2 are available on terms as set out in this Agreement.

Core Bitstream 4 Service

- 3.4** The core Bitstream Services provided as part of the Bitstream 4 Service are as follows:

- 3.4.1** An Ethernet A-EPL Service that supports transparent pass-through of 802.3 and 802.1Q frames on a designated UNI on the NID at the End User Premises (or Service Providers co-location space, as the case may be).

- 3.4.2** Delivered over a single 802.1ad SVLAN on the E-NNI at the POI.

- 3.4.3** All tagged and untagged traffic sent from the End User is treated as High Priority.

- 3.4.4** Multiple service plans are available to Service Providers, using the following parameters:

- (a) Access Rate; and
- (b) Service bandwidth,

as set out in the table below.

Access Rate	100/100 Mbps		1/1 GigE		10/10 GigE	
Service Bandwidth (High Priority)	-	-	100 Mbps	100 Mbps	1 Gbps	1 Gbps
	-	-	150 Mbps	150 Mbps	2 Gbps	2 Gbps
	-	-	200 Mbps	200 Mbps	3 Gbps	3 Gbps
	-	-	300 Mbps	300 Mbps	4 Gbps	4 Gbps
	-	-	500 Mbps	500 Mbps	5 Gbps	5 Gbps

Access Rate	100/100 Mbps		1/1 GigE		10/10 GigE	
	10 Mbps	10 Mbps	700 Mbps	700 Mbps	6 Gbps	6 Gbps
	-	-	1 Gbps	1 Gbps	7 Gbps	7 Gbps
	20 Mbps	20 Mbps	-	-	8 Gbps	8 Gbps
	30 Mbps	30 Mbps	-	-	9 Gbps	9 Gbps
	40 Mbps	40 Mbps	-	-	10 Gbps	10 Gbps
	50 Mbps	50 Mbps	-	-	-	-
	70 Mbps	70 Mbps	-	-	-	-
	100 Mbps	100 Mbps	-	-	-	-

3.4.5 The Bitstream 4 Service has similar characteristics to the other services within the family of Bitstream Services as identified below:

Attributes	Bitstream 2 Ultra	Bitstream 3	Bitstream 3a	Bitstream 3b	Bitstream 4
Bitstream	A-EVPL	A-EPL	A-EPL	A-EPL	A-EPL
High Priority	Yes	Yes	Yes	Yes	Yes
Low Priority	Yes	No	Yes	Yes	No
Service Bandwidths (Reference Offer) ¹	Low Priority from 50/20 up to 1G/500 Mbps. High Priority + Low Priority up to 1G/510.	From 2.5/2.5 Mbps up to 100/100 Mbps.	High Priority from 2.5/2.5 Mbps to 100/100 Mbps.	Low Priority from 50/50 up to Max/Max, with High Priority from 2.5/2.5 Mbps up to 100/100 Mbps.	From 10 Mbps up to 10 GigE.
MTU	2000 Bytes	2000 Bytes	2000 Bytes	2000 Bytes	9100 Bytes
MAC Addresses	16	64	64	64	128
Number of available UNIs	4x on Standard ONT	4x on Standard ONT	4x on Standard ONT	4x on Standard ONT	1x with second UNI available on request.
L2CP Support	No	No	No	No	Limited

¹ Bandwidth options for each Bitstream Service are detailed in each Bitstream Service Description and further options can be developed using the Product Development Process

Attributes	Bitstream 2 Ultra	Bitstream 3	Bitstream 3a	Bitstream 3b	Bitstream 4
Diversity	On request with limited availability.	On request with limited availability.	On request with limited availability.	On request with limited availability.	Available to Priority Users in selected areas.

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UNI - NNI characteristics

3.4.6 The Bitstream 4 Services requires a dedicated UNI.

3.4.7 The sum of High Priority traffic profiles of all services delivered at a UFB Handover Connection can exceed the UFB Handover Connection Service line rate. If there is insufficient line rate to deliver the High Priority traffic then frames will be randomly discarded and Service Levels do not apply. It is therefore the Service Provider's responsibility to shape and queue traffic appropriately.

Operations, Administration and Maintenance

3.5 The Bitstream 4 Service will support Service Provider remote access to the NID via a service management gateway for appropriate management. A Service Provider may request particular management attributes via the Product Development Process.

Service Requirements

3.6 To use the Bitstream 4 Service the Service Provider must have the capability to access and interconnect with it, by one of the following:

3.6.1 Co-locating Service Provider equipment at the POI using the Handover Connection Service and Central Office and POI Co-location Service;

3.6.2 Connecting to third party co-location space at the POI using the Handover Connection Service, and with the third party taking the Central Office and POI Co-location Service;

3.6.3 Connecting to a backhaul service at the POI; or

3.6.4 By using the Direct Fibre Access Service to connect to Service Provider equipment at a remote location within the Central Office area.

Additional Service Characteristics

3.7 The technical specification of the Bitstream 4 Service is set out in Appendix B.

3.8 The LFC will provide certain support and other assistance as part of the Bitstream 4 Service including:

3.8.1 An electronic facility for Service Requests;

3.8.2 An electronic facility for fault notifications; and

3.8.3 A tool to assist the Service Provider in determining the location and availability of the Bitstream 4 Service (pre-qualification),

each as more particularly set out in the Operations Manual.

3.9 The Bitstream 4 Service specifically excludes:

3.9.1 The Handover Connection Service;

3.9.2 Provision or maintenance of any cabling or connection or active device:

- (a) beyond the service demarcation points described in clause 4.1 and clause 5.1; and
- (b) between the jack terminating the LFC provided Fibre Lead-in and the NID, where that cabling or connection is not provided by the LFC and the LFC has not agreed to take responsibility for that cabling or connection.

3.9.3 Configuration, monitoring, operation, on-going support or maintenance of Service Providers' or End Users' applications, equipment or networks; and

3.9.4 Supply of AC mains & UPS power, accommodation space, heating, ventilating, and air conditioning and facilities at the POI or End User Premises.

Provisioning at an NBAP

3.10 A Standard Install for the Bitstream 4 Service to an NBAP includes:

3.10.1 A Fibre Lead-in from the Fibre Access Point to an ETP at the closest convenient point on the NBAP, as agreed with End User, where the Fibre Lead-in utilises no more than:

- (a) 100m of approved conduit or open trench (already in place at the time of installation); or
- (b) a double span of aerial drop lead on existing poles from the Fibre Access Point (this will include road crossings and is available only in areas where there is overhead deployment); or
- (c) 30m of buried lead-in (available only in areas where there is underground deployment); and

3.10.2 An extension of the Fibre Lead-in up to 10m radius from the ETP (there will not necessarily be a break in the Fibre Lead-in at the ETP) to:

- (a) a suitable mounted SC/APC² connector at a secure location inside the NBAP; or
- (b) if there is an OFDF beyond the ETP, a splice or LCA connector on the OFDF.

3.10.3 The LFC will provide Non-Standard Installs for the Bitstream 4 Service to an NBAP as an Ancillary Service.

² SC/APC – Standard Connector/Angle Polished Connector to IEC 61754-4.

4 Service Demarcation Point at End User Premises

- 4.1 The service demarcation point at the End User's Premises is as applicable, either:
- 4.1.1 For an RJ45 electrical interface is the 100/1000/10GBase-T UNI on the NID; or
 - 4.1.2 For an optical fibre glass only interface the 100Base-FX/1000GBase-LX Layer 1 termination point described in clauses 3.1.7 or 3.1.9 as applicable.
- 4.2 The Bitstream 4 Service excludes the End User Premises wiring. If a fault reported by the Service Provider is found to be caused by the End User Premises equipment (CPE) or the wiring at the End User's Premises beyond the service demarcation point, then the Service Provider may be charged the no fault found fee in the Price List. Note the wiring should comply with the industry standard Premises wiring requirements which are available at www.tcf.org.nz.

5 Service Demarcation Point at POI

- 5.1 The Bitstream 4 Service is delivered as a transparent VLAN (the logical service demarcation point) on the Handover Connection located at the POI or, using Tail Extension, at another handover point.
- 5.2 The physical service demarcation point is the MOFDF in the POI, which is part of the Handover Connection Service, or where Tail Extension is used, another handover point.
- 5.3 The Handover Connection Service is a separate service and is a prerequisite to the supply of the Bitstream 4 Service, i.e. Service Provider's must first purchase and then continue to maintain a Handover Connection Service at all times while taking the Bitstream 4 Service.

6 LFC and Service Provider Responsibilities

- 6.1 Other LFC and Service Provider responsibilities are detailed in the General Terms and the Operations Manual.

7 Fibre Diversity

- 7.1 The Bitstream 4 Service provides a single fibre between the Central Office and the End User's Premises.
- 7.2 Diversity (a second or subsequent instance of the Bitstream 4 Service between the Fibre Access Point and the Central Office) will be available to Priority User Premises on request for Premises located in major health-care facilities, secondary or tertiary education centres, central business districts, industrial parks, business parks and strip malls as an option for some but not all Premises. Diversity, as a standard product, may not be available to Premises outside of these areas. Standard Installation Service Levels do not apply to the provision of the diverse products and each instance will be treated as an individual line for the purpose of availability of Service Levels.
- 7.3 Where available, the diverse optical paths will be in separate fibre cable sheaths and if requested, in separate cable routes³. The diverse cable routes will be a minimum of the width of a street apart and should not share any manholes or access points. Separate entries into

³ While it is intended to make route diversity available for all Premises listed in clause 7.2, in some areas route diversity may not be available, or may only be available on a limited basis. The LFC's list of areas where route diversity is available, and areas where route diversity is not available may be provided by the LFC from time to time.

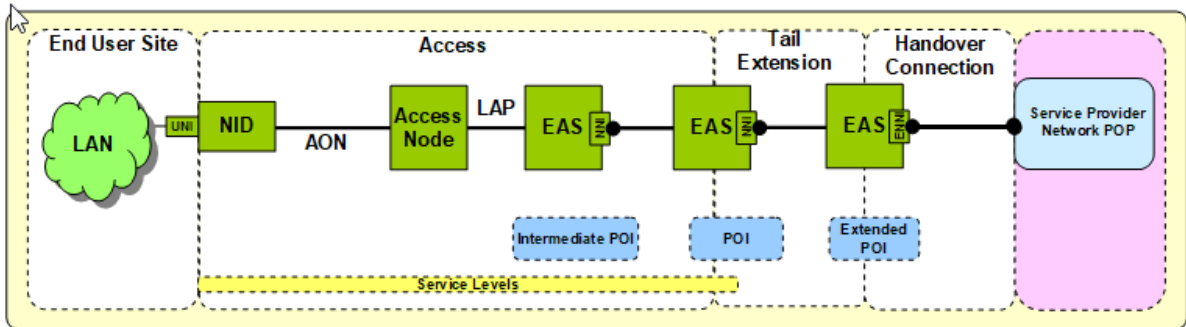
the Central Office will also be used where available.

- 7.4 Service Providers can also request diverse access to End User Premises, or access to diverse Central Offices as part of a Non-Standard Install, however this will not be available in all cases.
- 7.5 There may be practical limitations to providing full physical diversity to some sites. The provision of a separate entry to an LFC Central Office will have unique site-specific engineering considerations and may attract additional costs.

8 Bitstream 4 Service Levels

- 8.1 Service Levels for both the Layer 1 and Layer 2 components of the Bitstream 4 Service are set out in the Service Level Terms for the Bitstream Services.

Appendix A – Diagram



This is a generic diagram showing the standard configuration and service demarcation points. It is not intended to represent every situation or detailed physical architecture. The following points should be noted:

- The Bitstream 4 Service and pricing applies from the UNI to the E-NNI at the POI, i.e. there is no incremental charge from the Intermediate POI to the POI.
- The Service Provider can request Tail Extension to extend the Bitstream 4 service to a remote POI.
- Some Bitstream Services will have a single tier of aggregation, i.e. there is no Intermediate POI.
- Where there are multiple tiers of aggregation, the Service Provider can pick the service up at an Intermediate POI. This intermediate POI will service a limited Coverage Area.
- Service Levels (availability, network performance) only apply to UNI to POI.
- Access node and aggregation interconnection may use redundant links to meet Service Level requirements.

Appendix B - Technical Specification

Technical Specification	
Ethernet	<ul style="list-style-type: none"> • IEEE 802.3 – 2005 • 802.1q supporting 4050 VLANs
UNI	<p>RJ45:</p> <ul style="list-style-type: none"> • 100 Mbps = 100Base-T; • 1 Gbps = 1000Base-T; and • 10 Gbps = 10GBase-T. <p>Glass Only:</p> <ul style="list-style-type: none"> • 100 Mbps = 100Base-FX • 1 Gbps = 1000Base-LX <p>MTU:</p> <ul style="list-style-type: none"> • 9100 Bytes
Handover Connection (E-NNI)	<p>Ethernet:</p> <ul style="list-style-type: none"> • 802.1ad VLAN (SVID, CVID), or • Double tagged QnQ.
VLAN	<p>Point-to-Point (E-APL). MTU: 9100 Bytes: Unicast Frame Delivery = passed within service CIR. Multicast Frame Delivery = passed within service CIR. Broadcast Frame Delivery = passed within service CIR. Layer 2 Control Protocols Processing = limited (but may be amended by the LFC from time to time).</p>
Fibre	<p>External fibre must comply with ITU-T specification G.652D. Internal building fibres may comply with ITU-T G.657A. Fibre terminations must be SC/APC type connectors (complying with the IEC 61754-4 standard) or alternatively LC/APC type connectors (complying with the IEC 61754-20 standard) as appropriate. Laser types and path characteristics expected to be designed to a minimum standard which are contained in the documents IEEE 802.3 Section 5 standard. Testing for power loss will be at either 1310 or 1550 nm. 1625 nm reserved for non disruptive testing.</p>

