

Enable Networks UFB Services Agreement
Service Description for Bitstream 4

Version 2.0 August 2023

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 Service suitable for complex business grade applications delivered over point-to-point fibre access. Bitstream 4 is part of the UFB family of Bitstream Services:

Bitstream 2a	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 4	Based on the TCF Business Premium service.
Hyperfibre 2 & 3	Based on the LFC Hyperfibre Service Description
UFB 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 Diagrams of the configuration for the Bitstream 4 Service are set out in Appendix A. The Bitstream 4 Service provides an Access-EPL Bitstream Service from the NID or glass-only termination:
- 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 UFB Handover Connection Service located at the POI 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 Support for NID¹ or glass-only end-customer access termination types
- 2.4.2 It is available in two Access Rate configurations:
- a) 1/1 Gbps (1000/1000 Mbps);

¹ NID is available for access rates up to and including 1Gbps. 10Gbps access rates will be delivered as glass-only.

- b) 10/10 Gbps (10000/10000 Mbps)
 - where the Access Rate defines the maximum bandwidth that can be consumed on the access.
- 2.4.3 An Access EPL Bitstream Service delivered over Active Optical Network (P2P) fibre that allows up to 4050 VLANS to be passed transparently from the End User Premises or the Service Provider's co-location space to the Service Provider's UFB Handover Connection at the POI.
- 2.4.4 A range of standard service plans are offered as outlined in 3.4.4.
- 2.4.5 Supports tagged or untagged traffic by the End User.
- 2.4.6 For NID based services, supports 1000Base-T that is located at the End User site.
- 2.4.7 Glass-only services supports a connectorised fibre tail UNI that plugs into a compatible SFP in the end-customer CPE.
- 2.4.8 Supports the following optional features:
 - a) OAM Connectivity and Fault Management (NID only)
 - b) Access Diversity
- 2.4.9 For NID based services, supports;
 - a) 1000/1000 Base-T UNI
 - b) Access Diversity
- 2.4.10 For glass-only services, supports:
 - a) A connectorized fibre tail UNI that plugs into a compatible SFP/SFP+ in the end-customer CPE
 - b) 1 Gbps access rate (1000Base-X) with High Priority (CoS)
 - c) 10 Gbps access rate (10GBase-X) with High Priority (CoS)
 - d) Access Diversity
- 2.4.11 Complies with the Business Premium 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):²

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:

² Standard Install parameters may differ between LFCs.

- (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 a 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 LC/APC 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 LC/APC 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 LC/APC 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 plug on the end of the Fibre Lead-in from the ETP (which is the jack); or
 - (b) if there is an OFDF beyond the ETP, a splice or LC/APC plug on the OFDF,
- provided that any NID installed by the LFC as part of the Bitstream 4 Service will also be part of the LFC Network.
- 3.1.8 The termination point of the Layer 2 component of the Bitstream 4 Service is as applicable, either:
- (a) for an RJ45 electrical interface the 1000Base-T UNI on the NID; or
 - (b) for a glass-only interface;
 - (i) when delivered over 1 Gbps Access Rate (Optics), using 1000Base BiDi TX1310/RX1490nm (10km or 40km) to the Layer 1 Termination point described in Clause 3.1.7
 - (ii) when delivered over 10 Gbps Access Rate (optics), using 10GBASE BiDi TX1270/RX1330nm (10km or 40km) to the Layer 1 Termination point described in Clause 3.1.7

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 Premises, 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 connector); or
 - (b) if there is an OFDF beyond the ETP or End User Tenancy boundary, a splice or LC/APC 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 1000Base-T UNI on the NID; or
 - (b) for a glass-only interface;
 - (i) when delivered over 1 Gbps Access Rate (Optics), using 1000Base BiDi TX1310/RX1490nm (10km or 40km) to the Layer 1 Termination point described in Clause 3.1.9
 - (ii) when delivered over 10 Gbps Access Rate (optics), using 10GBASE BiDi TX1270/RX1330nm (10km or 40km) to the Layer 1 Termination point described in Clause 3.1.9

Alternative Termination Points

- 3.1.11 The LFC and the Service Provider may agree on a different termination point as part of a Non-Standard Install. 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, 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 Premise 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.
- 3.1.15 The Service Provider must ensure the End User provides a suitably located mains power outlet for the Customer Premises Equipment (CPE) 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 clauses 3.1.7, 3.1.9 or 3.1.11 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 MDUs); or
 - (b) 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;
- 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 3.3.3 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 Access-EPL Service that supports transparent pass-through of 802.3 and 802.1Q frames on a designated UNI delivered to the End User premises (or Service Provider's co-location space, as the case may be).
- 3.4.2 Delivered over a single 802.1ad SVLAN or Double Tagged QnQ 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.

Product Name	Access Rate	High Priority Bandwidth	Low Priority Bandwidth
Bitstream 4 1G CIR 100	1 Gbps	100/100 Mbps	0/0
Bitstream 4 1G CIR 200	1 Gbps	200/200 Mbps	0/0
Bitstream 4 1G CIR 500	1 Gbps	500/500 Mbps	0/0
Bitstream 4 1G CIR 1G	1 Gbps	1/1 Gbps	0/0
Bitstream 4 4G CIR 4G	10 Gbps	4/4 Gbps	0/0
Bitstream 4 10G CIR 10G	10 Gbps	10/10 Gbps	0/0

- 3.4.5 Access Rates defines the maximum downstream and upstream Layer 2 bandwidth allowed for that Access Rate:
 - a) 1000/1000 Mbps (1/1Gbps);
 - b) 10000/10000 Mbps (10/10Gbps)

Note the transmission of Ethernet frames includes additional overheads such as Ethernet preamble, frame delimiters and inter-frame gaps. This limits the maximum throughput to ~90% of the physical medium speed depending on frame size.

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

Attribute	Bitstream 2a	Bitstream 3	Bitstream 3a	Hyperfibre 2	Hyperfibre 3	Bitstream 4
Bitstream	A-EVPL	A-EPL	A-EPL	A-EVPL	A-EPL	A-EPL
High Priority	Yes	Yes	Yes	Yes	Yes	Yes
Low Priority	Yes	No	Yes	Yes	Yes	No
Service Bandwidths ³	From 50/10 Mbps up to 100/50 Mbps	From 2.5Mbps up and downstream to 100/100 Mbps	100/100 Mbps with High Priority from 2.5Mbps	2 Gbps 4 Gbps 8 Gbps	2 Gbps 4 Gbps 8 Gbps	100 Mbps 200 Mbps 500Mbps 1 Gbps 4 Gbps 10 Gbps
MTU	2000 Bytes	2000 Bytes	2000 Bytes	2000 Bytes	2000 Bytes	9100 Bytes
MAC addresses	16	64	64	16	64	128
Number of available UNIs	4 standard	4 standard	4 standard	1x 10G RJ45 4x 1G RJ45	1x 10G RJ45 4x 1G RJ45	1 (with a second UNI available on request for NID only)
L2CP support	No	No	No	No	No	Limited
Diversity	On request with limited availability	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

UNI – NNI characteristics

3.4.7 The Bitstream 4 Service requires a dedicated UNI.

3.4.8 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.

- a) It is recommended the aggregate CIR service bandwidth does not exceed 70% of UNI or E-NNI physical speed.
- b) The headline rate = CIR. There is no bandwidth overhead to compensate for higher protocol encapsulation overheads.

Operations, Administration and Maintenance

3.5 A Service Provider may request particular management attributes via the Product Development Process.

³ Bandwidth options for each Bitstream Service are detailed in each Bitstream Service Description and further options can be developed using 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 either a UFB Handover Connection Service or a Shared Handover Connection and Central Office and POI Co-location Service;
 - 3.6.2 Connecting to third party co-location space at the POI using the UFB 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 automated facility for Service Requests;
 - 3.8.2 An automated 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 UFB 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 clauses 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 at the POI or End User Premises.

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 1000Base-T UNI on the NID; or
 - 4.1.2 For an optic fibre glass only interface the 1000Base BiDi TX1310/RX1490nm (10km or 40km) or 10GBASE BiDi TX1270/RX1330nm (10km or 40km) 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' or Service Providers' 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 UFB Handover Connection located at the POI.
- 5.2 The physical service demarcation point is the MOFDF in the POI which is part of the UFB Handover Connection Service.
- 5.3 The UFB Handover Connection Service is a separate service and is a prerequisite to the supply of the Bitstream 4 Service i.e. the Service Provider must first purchase and then maintain a UFB 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 LFC Central Office and the End User's Premises.
- 7.2 Bitstream 4 supports Access Diversity options. Bitstream 4 diversity is available as a standalone product and does not require another Enable Bitsream or Direct Fibre Access product instance in the same End User Premises. Diversity (between the Fibre Access Point and the Central Office) will be available to Priority Users on request. Standard Installation Service Levels do not apply to the provision of diversity products and each instance will be treated as an individual line for the purpose of availability Service Levels.
- 7.3 Where available, the diverse optical paths will be in separate fibre cable sheaths and where possible, in separate cable routes⁴. The diverse cable routes will, where possible, be a minimum of the width of a street apart and should not share any manholes or access points. Separate entries into the Central Office will also be used where available.
- 7.4 The Service Provider can also request diverse access to End User Premises, or access to diverse Central Offices as an Ancillary Service where the network infrastructure to provide the diverse service does not already exist; 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.

⁴ While it is intended to make route diversity available for all Premises, in some areas route diversity may not be available, or only may be available on a limited basis.

Appendix A – Diagram

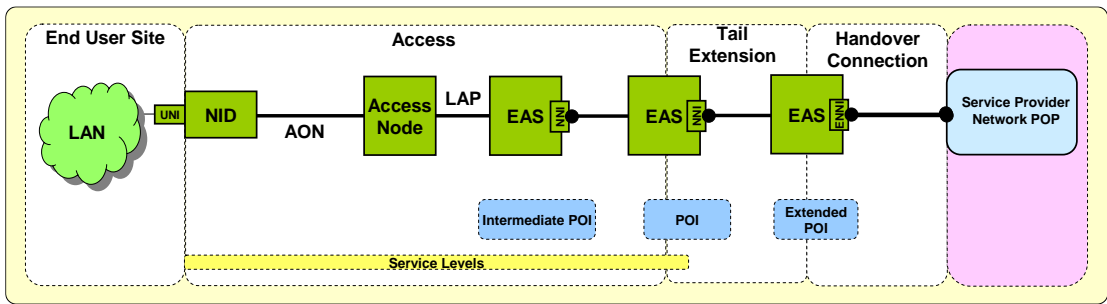


Figure 1: Bitstream 4 NID variant

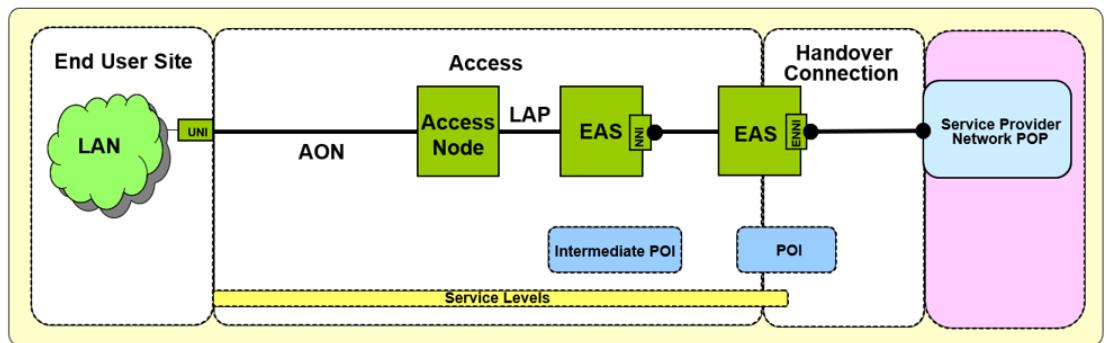


Figure 2: Bitstream 4 glass-only variant

These are generic diagrams showing the standard configuration and service demarcation points. They are 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.
- Some Bitstream Services will have a single tier of aggregation, i.e. there is no intermediate POI.
- Where there are multiple tiers of aggregation, Service Providers 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	<ul style="list-style-type: none"> • RJ45: <ul style="list-style-type: none"> ○ 1 Gbps = 1000Base-T • Glass Only: <ul style="list-style-type: none"> ○ 1 Gbps = 1000Base BiDi TX1310/RX1490nm (10km or 40km) ○ 10 Gbps = 10GBASE BiDi TX1270/RX1330nm (10km or 40km) • MTU: <ul style="list-style-type: none"> ○ 9100 Bytes
UFB 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 (A-EPL);</p> <p>MTU:</p> <ul style="list-style-type: none"> • 9100 Bytes <p>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>