User Network Interface – DSL

Network Interface Specification

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Version	Description	Effective Date
4.0	First issued version of WBA 4	1 December 2020

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1 About this document

In this document:

- Major Attributes are identified with a thick red border;
- Minor Attributes are identified with a thick blue border;
- Major and Minor Attributes in tables are identified by an associated cell within the table marked as either Major or Minor;
- Important information is identified with a thin black border with gold background and prefixed with the word "**Important**";

and

- all other attributes are Unsupported Attributes.

Any feature, parameter and/or behaviour of **nbn**™ Infrastructure which is not included in a Network Interface Specification is an Unsupported Attribute.

1.1 Classification of network attributes

nbn may, in its absolute discretion, identify or re-classify any attribute of the **nbn**™ Network in accordance with clause C13.5(a) of the Head Terms. Each attribute of the **nbn**™ Network may be classified as one of the following:

Classification	Description
Major	A Supported Attribute necessary for using a Product. Customer is expected to make use of the attribute as an input into Customer Products. Any Upgrade to such an attribute is anticipated to: • require Customer to take particular action to continue to use a Product after the implementation of the Upgrade; • result in a Product no longer being supplied by reason of the Upgrade; or • require Customer to commit material capital expenditure in response to implementation of that Upgrade.
Minor	A Supported Attribute necessary for using a Product. Customer is expected to make use of the attribute as an input into Customer Products. However, any Upgrade to such an attribute is not anticipated to be a Major Upgrade.
Unsupported	An attribute that is not a Supported Attribute and which need not be relied upon to use a Product. Customer should be resilient to changes to such an attribute.

Classification	Description
	Customer should not assume or rely upon specific network behaviour in connection with such attributes. Customer should consider these facts when connecting to any **nbn**™ Infrastructure, using a Product and constructing, configuring and supplying Customer Products.

The network attribute descriptions above do not define the Upgrade process that will apply in respect of Upgrades to those attributes. For that information, see clauses C13 and C17 of the Head Terms.

Customer must not rely on the currency of the descriptions of any Unsupported Attributes in any Network Interface Specification, which may change with limited or no notice or update to the Network Interface Specification.

Important information is provided to Customer where this information relates to how a Customer network must be configured to use a Product or where failure to observe a limitation will result in the Product not performing to specification.

1.2 Status

This document does not form part of any Wholesale Broadband Agreement or any Standard Form of Access Agreement for the purposes of Part XIC of the Competition and Consumer Act 2010 and does not vary any rights or obligations of a party under a Wholesale Broadband Agreement.

This document refers to and is to be read subject to the terms of the **nbn**™ Ethernet Product Module of the Wholesale Broadband Agreement.

2 UNI-DSL – Physical Interface

2.1 UNI-DSL Interface Modes

Section 4.1(a) of the **nbn**™ Ethernet Product Description and section 3.3 of the **nbn**™ Ethernet Product Technical Specification outline the product attributes of the UNI-DSL Product Component, including that the UNI-DSL is a VDSL2 interface in alignment with ITU-T G.993.2 (01/ 15) and supporting standards.

For UNI-DSL services it is Customer's responsibility to provide a VDSL2 modem, as outlined in section 2.2.

2.2 Modem Compatibility / Registration

Important:

The registration process consists of a self-certification, executed by Customer, followed by a registration of the self-certification by Customer to **nbn**. To register Modem, Customer must supply the Modem Vendor ID, System ID and Version Number as described in ITU-T G.993.2 section 11.2.3.6, as well as a clear-text name uniquely identifying the combination of hardware and firmware to be entered into the registration database.

Customer must not register Modem, unless:

- the Modem and its firmware supports all applicable mandatory ITU-T requirements for vectored VDSL2 and **nbn** UNI-DSL specifications referenced below;
- the Modem and its firmware has been tested successfully against every feature of the **nbn** UNI-DSL Specification outlined in section 2.3; and
- upon request, Customer can provide evidence that the above requirements are met.

Where Customer updates Modem hardware or firmware which impacts VDSL components or VDSL drivers, re-certification and re-registration for the new hardware and firmware combination is required.

Irrespective of whether Modem is registered, where specific Modem or a certain model and/or firmware of Modem is causing (or **nbn** reasonably considers that it is likely to cause) detriment to other services, **nbn** may:

- remove the Modem from the Modem registration list;
- place an Ordered Product using that Modem into a Repair Profile; and/or
- Suspend an Ordered Product using that Modem in accordance with the Head Terms.

2.3 UNI-DSL Specification

For the purposes of Modem self-certification by Customer, **nbn** will maintain a specification of the UNI-DSL interface comprised of three separate sections:

- a DSLAM chipset and firmware list;
- a list of mandatory DSL and OAM Features that the Modem must support; and
- a minimum rate-reach performance specification that the Modem must achieve.

Important: These specifications will be updated regularly and it is the responsibility of Customer to source Modem hardware and firmware updates to maintain compatibility.

2.3.1 DSLAM Chipset and Firmware

Important: The **nbn**™ Equipment, used in connection with **nbn**™ Ethernet (FTTB) and **nbn**™ Ethernet (FTTN), utilises chipsets to provide UNI-DSL services. Modem hardware and firmware intended for use with the UNI-DSL must support full vectored interoperability with all of the DSLAM chipsets and firmware combinations that **nbn** notifies Customer from time to time.

2.3.2 DSL and OAM Features

The UNI-DSL will utilise the DSL features listed below. Modem hardware and firmware intended for use with the UNI-DSL must be able to demonstrate compatibility with all of the requirements listed:

Table 1: Mandatory DSL and OAM Features

ID	Requirement	Standard References	Classification	Comment
1	All mandatory vectoring related functionality (excluding tests 8.1, 8.5, 8.7)[1]	ITU-T G.993.5 (01/15), BBF TR-249 Issue 1	Major	Crosstalk / FEXT reduction, substantial bit rate and stability improvements
2	G.inp	ITU-T G.998.4, BBF TR-115 Issue2 section 5.2. Test setup is intended for FEC testing - only 200us noise burst and some test adaptation required	Minor	Improved impulse noise protection with respect to I-FEC approach, improving end user experience and throughput under conditions of impulse noise.

[1] These excluded tests now form part of Minimum Modem Quality Standards as described in section 2.3.4 of this Network Interface Specification.

ID	Requirement	Standard References	Classification	Comment
	Support for on-line reconfiguration (OLR) specifically bit swapping and Seamless Rate Adaptation	ITU-T G.998.4 Amendment 1, BBF TR-115 Issue2 section 5.4	Minor	Improved stability. Higher throughput. Faster recovery when conditions change
	Intra-DTU interleaver, extended memory for Enhanced Net Data Rates with Vectoring, and Improved ATTNDR calculation methods	ITU-T G.998.4 Amendment 2	Minor	Further stability, throughput, recovery improvements
3	Seamless Rate Adaptation (SRA)	ITU-T G.993.2, BBF TR-115 Issue 2 section 5.4.3	Minor	Maximises throughput during showtime, and improves stability under slowly varying noise conditions
4				Requirements 1 to 3 of this table supported in both upstream and downstream directions. Some VDSL2 chipsets do not support G.inp in the upstream direction at this time.
5	Requirements 1 to 4 of this table useable simultaneously without restriction			Not acceptable that the listed capabilities are usable only separately, or are encumbered by restrictions regarding simultaneous use
6	Error(f) packets sent over layer 2 backchannel	ITU-T G.993.5 section 7.4.1	Minor	G.993.5 section 7.4.2 describes an alternative Error(f) technique but section 7.4.1 method will be deployed due to

ID	Requirement	Standard References	Classification	Comment
				shortcomings of the alternate method.
7	Modem prioritises processing of Error(f) packets even in condition of end user traffic congestion or other overload		Minor	Necessary for satisfactory operation of vectoring
8	Support for orderly and disorderly shut-down (within 10ms) events	ITU-T G.993.5 section 9	Minor	Stability of neighbouring lines, stability of neighbouring vectored lines
9	Protection against single wire connections and disorderly leaving events in the upstream direction (e.g. when cable is cut)	BBF TR-249 section 9.4 (single wire interruption test)	Minor	Modem must pass this test, interrupting upstream transmissions promptly upon detection of changes or interruption in the downstream received signal
10	Monitored tones / sub-carriers	ITU-T G.993.2, sections 3.36, 10.3.3.1, 10.3.4.4, BBF TR-115 Issue 2 section 5.4.1, + Issue 2 Amendment 1 section 5.4.5, + need to add a bit loading recovery test	Minor	Support for monitor tones, and recovery of tones with zero bit loading to a non-zero bit loading
11	Alternative Electrical Length Estimation Method (AELEM)	ITU-T G.993.2 Amendment 7	Minor	Reduces loop length estimation errors in presence of bridged taps. Reduced impact on neighbouring lines in presence of bridged taps,

ID	Requirement	Standard References	Classification	Comment
				particularly when operating unvectored.
12	Inventory identification request supported and returns valid and unique responses for Modem and Chipset Vendor ID and version	ITU-T G.993.2 sect 11.2.3.6, G.994.1, G.997.1 sects 7.4.2, 7.4.4, 7.4.6, 7.4.8, and BBF ITU-T TR-115	Minor	Unique and valid responses required for both Modem vendor ID and firmware version number, plus Chipset vendor ID and firmware version number - so that Modem and its chipset can be uniquely identified both in terms of HW and firmware
13	Reporting of valid H-log in all parts of spectrum, with and without DPBO/UPBO applied in that part of spectrum	ITU-T G.993.2 section 11.4.1	Minor	Some Modem reports false H-log and other tone/spectrum data in parts of spectrum where power backoff applied.
	Reporting of valid TxPSD in all parts of spectrum, with and without DPBO/UPBO applied in that part of spectrum		Minor	
	Reporting of valid QLN in all parts of spectrum		Minor	
	Reporting of valid SNR in all parts of spectrum, with and without DPBO/UPBO applied		Minor	

ID	Requirement	Standard References	Classification	Comment
	in that part of spectrum			
14	US0 band	ITU-T G.993.2	Minor	Support for US0 is critical to the operation of assurance activities in connection with the remediation of loop impairments such as bridged taps.
15	B8-11 profile	ITU-T G.993.2	Major	
	B8- 17 profile is desired	ITU-T G.993.2	Minor	
16	Virtual noise	ITU-T G.993.2 section 11.4.1	Minor	Improved stability and throughput in presence of Time Of Day dependent or varying noise environment
17	DELT loop diagnostics mode		Minor	
18	Different delay and INP settings for each direction		Minor	
19	Upstream and Downstream Power Backoff must be supported	ITU-T G.993.2, ITU-T G.997.1	Major	
20	Use of at least 16 RFI band notches simultaneously		Minor	
21	Robust Overhead Channel (ROC)	ITU-T G.993.2 section 9.5.3.1	Minor	Improves stability in harsh conditions
22	Support for autonomous transmission of	ITU-T G.997.1 section 7.1.1.1.3, BBF TR-115 Issue 2	Minor	Assist determination of the cause of intermittent service issues

ID	Requirement	Standard References	Classification	Comment
	Loss-Of-Power (LPR) message	Amendment 1 section 5.10		
23	Downstream Frequency Dependent Pilot Sequence (FDPS)	ITU-T G.993.5 Amendment 1 section 7.2	Minor	Reduces initialisation time when entering a vectoring group
	Upstream Frequency Dependent Pilot Sequence (FDPS)	ITU-T G.993.5 Amendment 1 section 7.3.3	Minor	
24	BER no greater than 1E-10 with 6dB noise margin, no impulse noise, in both fast and interleaved modes	BBF TR-114 Issue 2 section 8.1 and 8.2 Table 23	Minor	Modem PHY capable of supporting a higher layer service that can achieve a basic / repeatable end to end SLA
	BER no greater than 1E-7 with 0dB noise margin, no impulse noise, in both fast and interleaved modes		Minor	
25	Sufficient memory and processing resources to sustain 100 Mbit/s (Layer 2) across the UNI-DSL port in the downstream direction, in presence of correctable REIN and SHINE with G.inp active		Minor	Must be simultaneous with upstream sustained traffic requirement
	Sufficient memory and processing resources to sustain 40 Mbit/s (Layer 2)		Minor	

ID	Requirement	Standard References	Classification	Comment
	across the UNI-DSL port in the upstream direction, in presence of correctable REIN and SHINE with G.inp active			
26	Single Rate Three Colour upstream traffic shaping for TC1 / TC2 / TC4	IETF RFC-2697	Minor	Ensure that modem correctly shapes upstream traffic to a rate that will pass DSLAM traffic policers according to contracted service rates
27	Support for Ethernet OAM. Specifically, the Modem WAN interface must respond to LBM, SLM and DMM at MD level 2 and 3, directed at multicast MAC address 01-80-C2-00-00-32 (for MD level 2), 01-80-C2-00-00-33 (for MD level 3) and as well as the Modem's WAN unicast MAC address	Y.1731 (11/13)	Major	Support for OAM is critical to the operation of assurance activities.
28	SOS	ITU-T G.993.2 (01.2015) and Amdt 1 (11/2015	Minor	Improves stability in case of sudden noise increase.

2.3.3 Modem Performance Requirements

Modem hardware and firmware intended for use with the UNI-DSL must pass the performance tests and conditions defined in TR-114 issue 2, with the modifications described below:

- TR-114 specifies non-vectored performance. The bitrates in Table 2 are therefore non-vectored performance rates. Although these benchmark performances are non-vectored

rates, **nbn**'s network requires all Modem hardware to support and interoperate correctly with **nbn**'s vectoring implementation.

- TR-114 does not cover the band plan and TxPSD masks that **nbn** is deploying in its FTTB Network and FTTN Network footprints. When performing TR-114 tests, DSLAMs and modems should be configured in Fast Path mode, with the 998ADE17-M2x-A masks and band plan (also known as B8-11). The benchmark results below assume this band plan and Fast Path mode. Testing should otherwise be conducted in accordance with TR-114 998ADE17-M2x-B (B8-12) masks and band plan, and relevant G993.2 Annex B configurations and requirements.

Table 2: Modem VDSL Performance Requirements[2]

Distance	Minimum Net Data Rate Achieved DS (B8-11 Fast mode)	Minimum Net Data Rate Achieved US (B8-11 Fast mode)
150m	56,841	20,327
450m	36,382	14,346
1050m	16,449	1,956
1500 m	8,789	540

2.3.4 Minimum Modem Quality Standards

Important: All Modems must at a minimum comply with sections 2.3.1, 2.3.2 and 2.3.3 above.

To comply with the Minimum Modem Quality Standards the following test criteria in this section 2.3.4 must be met or exceeded.

Table 3: Summary of minimum modem quality standard tests

Broadband Forum	Issue	Amendment	Standard Name	Tests
TR-114	3	4	VDSL2 Performance Test Plan	15.1, 15.2
TR-249	1	1	Testing of G.993.2 Self-FEXT Cancellation (vectoring)	8.1, 8.5, 8.7

2.3.4.1 TR-114 Pass Criteria

Tests conducted using BA17ade profile and **nbn** line card.

[2] Performance requirements as per TR114 Issue 2, November 2012.

Table 4: 15.1 Rate adaptive performance tests for BA17ade with DPBO and UPBO, retransmission disabled.

Loop Length (metres)	Downstream (kbps)	Upstream (kbps)
150	46,600	15,400
450	39,800	11,400
1,050	25,100	3,900
1,200	21,400	3,800
1,500	14,500	1,500

Table 5: 15.2 Rate adaptive performance tests for BA17ade with DPBO and UPBO, retransmission enabled

Loop Length (metres)	Downstream (kbps)	Upstream (kbps)
150	56,403	20,080
450	41,437	14,726
1,050	24,178	4,992
1,200	21,004	4,271
1,500	14,167	1,845

2.3.4.2 TR-249 Pass Criteria

Test conducted using BA17ade profile, **nbn** line and vectoring card and **nbn** cable.

Table 6: TR-249 Pass Criteria

Test	Pass criteria
8.1 Collocated Vectoring CPEs Test Case	Expected Results listed in TR-249(i1) 8.1.4
8.5 Non-Collocated Vectoring CPE Test Case (3 loop lengths – referenced in Table 17 - Loops used for Testing)	Expected Results listed in TR-249(i1) 8.5.4
8.7 Long Term Stability Test Case	Expected Results listed in TR-249(i1) 8.7.4

2.4 Central Splitter / Filter

Important: Central Splitters (or Filters)[3] used in the Premises in conjunction with **nbn**™ Ethernet (FTTB) and **nbn**™ Ethernet (FTTN) must comply with Australian Standard AS/CA S041.3:2015 "Requirements for DSL Customer Equipment for connection to the Public Switched Telephone Network – Part 3: Filters for use in connection with all DSL services".

2.5 Ethernet frame support

Important: For UNI-DSL services Ethernet frames are supported using the Packet Transfer Mode and 64/65 Octet framing in accordance with ITU-T G.993.2 "L.3 Packet transmission convergence function (PTM-TC)"

[3] Also referred to as "Centralised Filter (Master Splitters)" within AS/CA S041.3:2015.

3 UNI-DSL Ethernet Frame

3.1 Frame Format

The **nbn**™ Ethernet implements untagged or single-tagged (C-Tag) Ethernet frames at the UNI-DSL as defined in IEEE802.1ad and illustrated by the following figure.

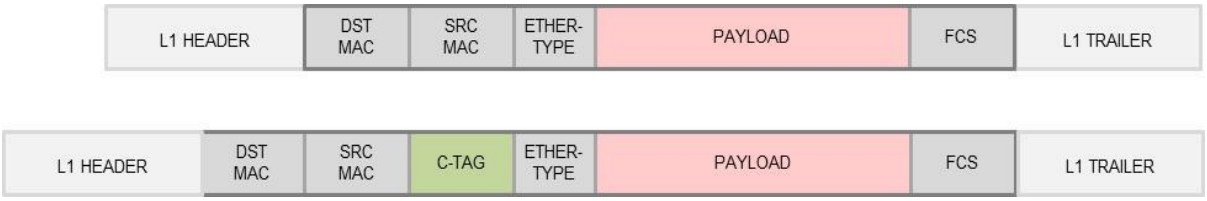

Figure 1: Untagged and Single-Tagged Ethernet Frames

Important: The tag option implemented is selectable by Customer. For tagged traffic at ingress to the UNI-DSL, any data following the first tag (C-Tag) will be assumed to be payload and will not be used by the **nbn**™ Network to determine any action. This section of the frame may be used to capture any type of additional tagging, and allow Customer to deliver a Customer Edge Virtual Local Area Network (**CE-VLAN**) transparent service.[4]

3.2 MAC Address Limitations

Each UNI-DSL is capable of supporting up to eight simultaneous MAC source addresses.

Important: This imposes a limit on the number of Layer 2 devices that Customer may allow to connect directly to each UNI-DSL. Any attempt to connect a number of devices directly to a UNI-DSL that exceeds this limit will result in traffic from the newly-attached devices being discarded.

The **nbn**™ Network will learn the first eight MAC source addresses detected at ingress to the UNI-DSL, based upon ingress service frames. A MAC address ageing function ensures that any obsolete MAC addresses are removed from the active list, after a period of 300 seconds.

Note that this limitation applies for the UNI-DSL irrespective of the service type and does not imply MAC address-based forwarding for unicast services based on 1:1 VLANs.

Customer should use a device that performs Layer 3 routing to interconnect to the UNI-DSL. If Customer does not do so, Customer accepts the consequences of any issues arising from MAC address restrictions.

[4] Access Loop Identification functionality is not supported where Customer uses the relevant section of the frame to deliver a CE-VLAN transparent service.

3.3 UNI-DSL Addressing Modes

The UNI-DSL supports four addressing modes for accessing AVCs, and indicating the priority of service frames across the UNI-DSL:

- Default-Mapped
- DSCP-Mapped
- Priority-Tagged
- Tagged

These options for addressing services at the UNI-DSL are shown in Table 7.

Table 7: AVC Addressing Modes at the UNI-DSL

UNI-DSL Mode	Maximum Number of AVCs addressable at UNI-DSL	Ability to communicate priority information across UNI-DSL?	Comments
Classification	Minor	Major	
Default-Mapped	1	N	Untagged service frames that carry no Layer 2 priority information, as per IEEE802.3.
DSCP-Mapped	1	Y	Untagged service frames that carry no Layer 2 priority information, as per IEEE802.3, where priority information is encoded into the DSCP field, as per RFC2474 for both IPv4 and IPv6.
Priority-Tagged	1	Y	Service frames at the UNI-DSL that carry Layer 2 Priority Information in the VLAN tag, as per IEEE 802.1p, where priority information is encoded into the VLAN Priority-Code-Point (PCP) field.
Tagged	1	Y	

The addressing mode must be specified at time of solution definition, and determines how Customer interfaces to the AVC and UNI-DSL.[5] These modes have no impact on the operation or allocation of AVC C-TAGs at the NNI.

[5] Note the limitations on addressing mode and AVC traffic class combinations tabled in Appendix A and Appendix B of the **nbn**™ Ethernet Product Technical Specification.

3.4 Frame Tagging – VLAN Structure

Priority-Tagged and Tagged UNI-DSL Addressing Modes require the following single-tagged field.

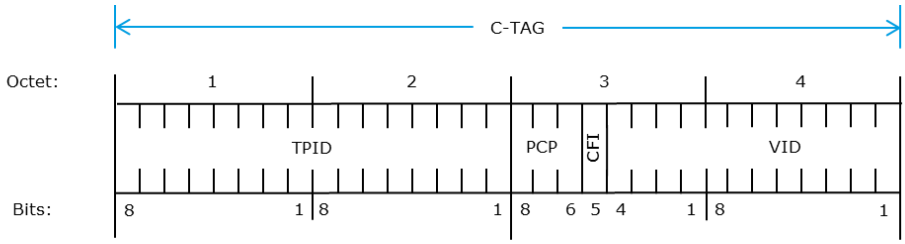

Figure 2: C-Tag Structure (4 Bytes)

- C-TPID – Tag Protocol Identifier, used to identify the tag type
- C-PCP – Priority Code Point Identifier, used for priority marking
- S/C-CFI – Canonical Format Identifier, not used
- S/C-VID – VLAN Identifier, used for service identification

Priority-Tagged and Tagged UNI-DSL modes require Customer to specify a C-VID value. The valid range of C-VID values is shown below in Table 8.

Table 8: C-Tag C-VID Requirement at the UNI-DSL

Interface Mode	nbn™ Network	Comment	Classification
Default-Mapped	FTTB, FTTN	C-VID is not supported at the UNI for this mode.	Major
DSCP-Mapped	FTTB, FTTN	C-VID is not supported at the UNI for this mode.	Major
Priority-Tagged	FTTB, FTTN	In Priority-Tagged mode, a C-VID allocation of anything other than 0 or Null (unpopulated) may result in unsupported behaviours	Major
Tagged	FTTB, FTTN	In Tagged mode C-VID allocations must match the C-VID specified by Customer at the time Customer orders the associated AVC. C-VID allocations outside of the allowed range (2 – 4004) will result in frames being discarded.	Major

Important: The C-VID is designed to be validated at ingress to the UNI-DSL. Any traffic that does not comply with this tagging structure, including ingress frames to the UNI-DSL (in Default-Mapped or DSCP-Mapped modes) that contain an IEEE802.1Q VLAN tag, or contains C-VID settings that are not agreed values, may be discarded at ingress to the UNI-DSL.

3.4.1 Tag Protocol Identifier (TPID) Formats

Table 9 describes the required TPID values for service frames at ingress to the **nbn**™ Network. The UNI-DSL TPID is set per UNI-DSL. Any received service frames that do not comply with these values will be discarded at the UNI-DSL ingress.

Table 9: TPID (UNI-DSL) Requirements

Interface Mode	S-TPID	C-TPID	Comment	Classification
Default-Mapped	N/A3F3F3F3F[6]	N/A	UNI-DSL operating in Default-Mapped or DSCP-Mapped modes do not support a S-TAG or C-TAG at ingress. Any tagged frames ingressing at the UNI-DSL may be discarded. For UNI-DSL, the C-TPID is supplied by **nbn**.	Major
DSCP-Mapped				Major
Priority-Tagged		0x8100	Priority-Tagged UNI-DSL requires all ingress service frames to comply with the C-TPID.	Major
Tagged		0x8100	Tagged UNI-DSL require all ingress service frames to comply with the C-TPID, and subscribed C-VID.	Major

3.4.2 EtherType

Table 10: Supported EtherType on a Tagged Ethernet frame describes the EtherType supported on a tagged Ethernet frame at the UNI- DSL and its behaviour.

Table 10: Supported EtherType on a Tagged Ethernet frame

EtherType	Protocol	Behaviour	Classification
0x0800	Internet Protocol version 4 (IPv4)	Transparent pass-through	Major
0x86DD	Internet Protocol version 6 (IPv6)	Transparent pass-through	Major
0x0806	Address Resolution Protocol (ARP)	Transparent pass-through	Major

[6] S-TPID appended by **nbn**™ Network and not visible at UNI-DSL.

EtherType	Protocol	Behaviour	Classification
0x8863	PPPoE Discovery Stage	Refer to Section 4.4 of Access Virtual Circuit Network Interface Specification	Major
0x8864	PPPoE Session Stage	Refer to Section 4.4 of Access Virtual Circuit Network Interface Specification	Major
0x88A8	DHCPv4 Relay Agent Option 82	Refer to Section 4.3 of Access Virtual Circuit Network Interface Specification	Major
0x88A8	DHCPv6 Relay Agent Option 18	Refer to Section 4.3 of Access Virtual Circuit Network Interface Specification	Major
0x8847	Multi- Protocol Label Switching (MPLS) unicast	Transparent pass-through	Major
0x8848	Multi- Protocol Label Switching (MPLS) multicast	Transparent pass-through	Major

Important: Transparency of other EtherTypes has not been tested by **nbn** and are unsupported.

3.5 Frame Addressing – Frame Forwarding

The UNI-DSL implements forwarding of service frames as per IEEE802.1ad, section 8.6.

Table 11: UNI-DSL Frame Forwarding Details

Destination MAC Address	Application	Default Behaviour	Optional Configurable Behaviour	Classification
01-80-C2-00-00-00	Bridge Group Address	Discard	None	Major
01-80-C2-00-00-01	IEEE Std 802.3 PAUSE	Discard	None	Major
01-80-C2-00-00-02	LACP/LAMP	Discard	None	Major
	Link OAM	Discard	None	Major
01-80-C2-00-00-03	IEEE Std. 802.1X PAE address	Discard	None	Major
01-80-C2-00-00-04 - 01-80-C2-00-00-0F	Reserved	Discard	None	Major
01-80-C2-00-00-10	All LANs Bridge Management Group Address	Discard	None	Major
01-80-C2-00-00-20	GMRP	Discard	None	Major

Destination MAC Address	Application	Default Behaviour	Optional Configurable Behaviour	Classification
01-80-C2-00-00-21	GVRP	Discard	None	Major
01-80-C2-00-00-22 - 01-80-C2-00-00-2F	Reserved GARP Application addresses	Discard	None	Major
01-80-C2-00-00-30 - 01-80-C2-00-00-3F	CFM	Tunnel4F4F4F4F[7]	None	Major

Note the following definitions for the purposes of the above table:

- Discard – the service frame will be discarded at ingress to the **nbn**™ Network
- Tunnel – the service frame is passed to the AVC/CVC and carried through the **nbn**™ Network

3.6 Frames Size – Maximum Layer 2 Frame Size[8]

Figure 3 depicts the definition of the maximum Layer 2 frame size at the UNI-DSL, highlighting the exclusion of the S-TAG and C-TAG. Note that this example shows a UNI-DSL service frame using either Default-Mapped or DSCP-Mapped modes.

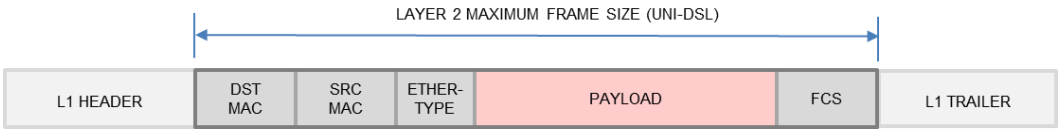

Figure 3: Definition of Maximum Layer 2 Frame Size (UNI-DSL, Default-Mapped and DSCP-Mapped Mode)

Figure 4 depicts the definition of the maximum Layer 2 frame size at the UNI-DSL, highlighting the inclusion of the C-Tag as provided by Customer. Note that this example shows a UNI-DSL service frame using either Priority-Tagged or Tagged modes.

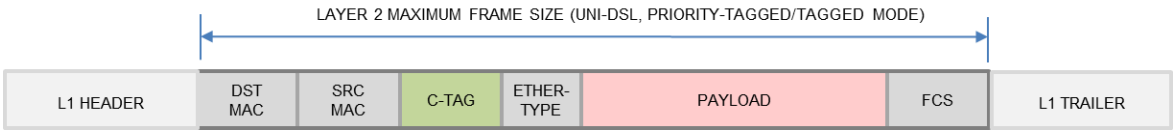

Figure 4: Definition of Maximum Layer 2 Frame Size (UNI-DSL, Priority-Tagged and Tagged Mode)

[7] Tunnelling supported for Maintenance Domains (MD) 4, 5, 6, 7.

[8] This is also known as the Maximum Transmission Unit (MTU).

Table 12 describes the maximum and minimum Layer 2 frames sizes that will be accepted by the **nbn**™ Network, taking into consideration the UNI-DSL Addressing Mode and type of **nbn**™ Network.

Table 12: Layer 2 Maximum Frame Size for nbn™ Ethernet (FTTB) and nbn™ Ethernet (FTTN)

Parameter	FTTB/FTTN	Classification
Maximum Layer 2 Frame Size at UNI-DSL (Default-Mapped or DSCP-Mapped)	1,592 Bytes	Minor
Maximum Layer 2 Frame Size at UNI-DSL (Tagged or Priority-Tagged Mode)	1,596 Bytes	Minor
Minimum Layer 2 Frame Size at the UNI-DSL (Default-Mapped or DSCP-Mapped Model)	64 Bytes	Minor
Minimum Layer 2 Frame Size at UNI-DSL (Priority-Tagged or Tagged Mode)	68 Bytes	Minor

Important: Frames that exceed frame size limits may be silently discarded. It is the responsibility of the Customer to manage the frame size of their traffic before it enters the **nbn**™ Network.

4 Class of Service (CoS)

4.1 Priority Identification

The UNI-DSL supports the following marking scheme for the purpose of priority identification.

- Priority Code Point (PCP) as per IEEE802.1p is Supported as a Major

DiffServ Code Point (DSCP) as per RFC2474 is Unsupported

The marking scheme utilised depends on the UNI-DSL Addressing Mode selected as follows.

Table 13: UNI-DSL Addressing Mode Marking Scheme

UNI-DSL Address Mode	Marking Scheme	Classification
Default-Mapped	Unmarked	Major
DSCP-Mapped	DSCP	Major
Priority-Tagged	PCP	Major
Tagged	PCP	Major

Note that the DSCP priority marking for ingress traffic at the UNI-DSL is supported only for traffic encapsulated as IP over Ethernet.

4.2 Priority Encoding (Ingress) and Decoding (Egress)

Important: Priority encoding and decoding interworking between the Customer Equipment and the **nbn**™ Network at the UNI-DSL is dependent on the UNI-DSL Addressing Mode selected.

Customer will be required to specify all required UNI-DSL and NNI assignments during the on-boarding phase for **nbn**™ Ethernet (FTTB) and **nbn**™ Ethernet (FTTN).

4.2.1 Unmarked (Default-Mapped)

In the case of Default-Mapped, Customer Equipment is not required to encode and decode priority information at ingress to and egress from the UNI-DSL as the traffic is directly mapped to a nominated traffic class within the **nbn**™ Network as specified by the relevant AVC Bandwidth Profile tables in Appendix B to the **nbn**™ Ethernet Product Technical Specification.

Important: Note, all ingress traffic will be mapped to the Default-Mapped traffic class, irrespective of DSCP markings.

4.2.2 DSCP (DSCP-Mapped)

Important: In the case of DSCP-Mapped, Customer Equipment must encode and decode priority information using DSCP settings at ingress to and egress from the UNI-DSL in order to ensure frames are mapped to the correct AVC traffic classes.

Table 14: DSCP Setting for UNI-DSL DSCP-Mapped Addressing Mode

AVC Traffic Class	DSCP	DSCP Decimal	Classification
TC-1	CS5, EF	40 – 47	Major
TC-2	CS4, AF41 – 43	32 – 39	Major
TC-4	CS1, AF11 – 13 CS0, Default	0 – 7	Major
	CS2, AF21 – 23	8 – 15	Minor
	CS3, AF31 – 33	16 – 31[9]	
	CS7, CS6	48 – 63	

Notes:

- Ingress assignments are valid for ordered AVC traffic classes only
- Any ingress traffic with DSCP markings that do not map to a provisioned AVC traffic class will be mapped to the TC-4 traffic class
- DSCP marking is available at the UNI-DSL only. PCP is required at the NNI

4.2.3 PCP (Priority-Tagged and Tagged)

Important: In the case of Priority-Tagged or Tagged, Customer Equipment must encode and decode priority information using PCP settings at ingress to and egress from the UNI-DSL in order to ensure frames are mapped to the correct AVC traffic classes.

[9] This range may be re-allocated to a separate traffic class in the future.

Table 15: PCP Setting for UNI-DSL DSCP-Mapped Addressing Mode

AVC Traffic Class	PCP Setting	Classification
TC-1	5	Major
TC-2	4	Major
TC-4	0	Major

Notes:

- Ingress assignments are valid for ordered traffic classes only
- Ingress traffic with PCP markings that do not map to a provisioned AVC traffic class will be discarded