nbn® Smart Places - Product Technical Specification

nbn® Smart Places Product Module

Wholesale Broadband Agreement

This document forms part of NBN Co's Wholesale Broadband Agreement, which is a Standard Form of Access Agreement for the purposes of Part XIC of the Competition and Consumer Act 2010 and constitutes nbn's Latest Standard Offer

nbn® Smart Places - Product Technical Specification

Smart Places Product Module

Wholesale Broadband Agreement

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Roadmap

A roadmap describing the structure of this **nbn®** Smart Places Product Technical Specification follows for the assistance of RSP.

1 Scope and purpose

1.1 Purpose

This **nbn**® Smart Places Technical Specification sets out the technical specifications for the **nbn**® Smart Places Product. It forms part of the **nbn**® Smart Places Product Module.

1.2 Scope

Sections 2 to 8 of this **nbn**® Smart Places Product Technical Specification describe the features of **nbn**® Smart Places, as offered by **nbn**.

1.3 Definitions

Capitalised terms used but not defined in this **nbn**® Smart Places Product Technical Specification have the meaning given in the Dictionary.

If a capitalised term used in this document is not defined in the Dictionary, then that term has the ordinary meaning commonly accepted in the industry.

2 Introduction

2.1 Service Type Availability

This section provides a brief overview of the service types that RSP may choose to deploy using **nbn**® Smart Places.

2.1.1 Unicast Data Services

nbn® Smart Places supports the flexible delivery of unicast data services. **nbn**® Smart Places uses logical, Layer 2 circuits that provide transparency to network layer protocols such as IPv4 and IPv6 that enable access to a variety of higher-level data applications, including internet access and tunnelling protocols.

These unicast services provide physical point-to-multipoint (aggregated) connectivity between a UNI located at a Smart Location and a centrally-aggregated NNI supplied to RSP by **nbn**.

2.2 Class of Service (CoS) Architecture

The **nbn**® Network implements a number of traffic classes that are distinguished in capability and performance, designed to accommodate the widest variety of higher-layer applications. RSP may take advantage of these traffic classes to provide more tailored performance and effective utilisation of the **nbn**® Network.

2.2.1 Traffic Classes

Traffic is scheduled within the **nbn**® Network using strict priority, according to the traffic class. The available traffic classes are described in Table 1.

Traffic Class	Example Applications	Specification
TC-2	Streaming standard and high definition video and real-time collaboration applications	CIR
TC-4	Best-effort data	PIR [1]

Table 1: Available Traffic Classes

RSP may use these classes to allocate service capacity in a manner that reflects the demands and operation of its end-to-end applications. The performance attributes of each respective traffic class are described in section 7.

[1] TC-4 is implemented as PIR at both the AVC and the CVC, meaning that:

- AVC TC-4 capacity is shared with other traffic classes across the UNI and is available for TC-4 when higher-priority traffic classes are not utilising it; and
- CVC TC-4 capacity is shared with other CVC and OVC traffic across the NNI.

Note that for traffic classes where RSP is required only to specify the CIR (i.e. for which the PIR is not specified), the PIR will be automatically set by **nbn** to align with the specified CIR according to the relevant traffic class.

For traffic classes which do not support a CIR (AVC TC-4 and CVC TC-4), no CIR is provided.

2.2.1.1 TC-2 Description

The TC-2 traffic class is targeted towards real-time, interactive multimedia applications, with the following characteristics:

- High bit-rates, and large Ethernet Frame Sizes
- Low Frame Delay, Frame Delay Variation, Frame Loss

The attributes of this class are aligned to the characteristics of the DSCP Assured Forwarding (**AF**) per-hop behaviour described in RFC4594.

TC-2 provides a committed level of premium capacity with limited ability to burst above its CIR, suitable for applications that require deterministic performance and are likely to be sensitive to Frame Delay Variation (FDV/jitter) and Frame Loss (FLR).

2.2.1.2 TC-4 Description

The TC-4 traffic class is targeted towards "best effort" applications, as characterised by the DSCP Default Forwarding per-hop behaviour, described in RFC4594.

2.2.2 Bandwidth Profile Parameter Considerations

This section describes the bandwidth profile parameters used within the **nbn**® Network.

2.2.2.1 Calculation of Information Rate

All Information Rate limitations, including as set out in this **nbn**® Smart Places Product Technical Specification, are enforced at the NNI interface between the RSP and the **nbn**® Network.

Where the bandwidth profile is equivalent to or greater than the negotiated Line Rate, a degraded useable payload will occur.

The Peak Information Rate for **nbn**® Smart Places is calculated on Layer 2 Ethernet service frames, over the series of bytes from the first bit of the Destination MAC Address through the last bit of the Frame Check Sequence. IEEE 802.3 physical-layer fields such as the preamble, start of frame delimiter and inter-frame gap are not included in the Bandwidth Profile.

This means the effective Layer 2 payload rate of the **nbn**® Network will degrade slightly for lowest-sized Ethernet service frames. This is the expected behaviour for Ethernet-based services for which the bandwidth profile is based on the service frame definitions in the relevant Network Interface Specification. It is the responsibility of RSP to accommodate any payload rate degradation as a result of Layer 2 Frame Sizes. Effectively, in compliance with the IEEE 802.3 standards, the Peak Information Rate is limited by capability depending on the Frame Size as described in Table 1.

Frame Size (Byte)	Maximum effective layer 2 Information Rate (Mbps)
64	735
128	838
986	970
1518	970
2000	970

Table 1: Maximum effective Layer 2 Information Rate range

2.2.2.2 Committed Burst Size

The CBS is set by **nbn** for each CIR specification, and cannot be modified. The CBS may differ between traffic classes, and may be specified differently for the UNI and NNI, and between the AVC and CVC.

The CBS is used by the policing functions of the **nbn**® Network at ingress to the **nbn**® Network to determine whether a stream of ingress data complies with the subscribed CIR. RSP is responsible for ensuring that all ingress traffic is shaped to comply with the CIR/CBS as specified for the required traffic class and interface, before presentation to the UNI or NNI as relevant. CBS values are set out in the Network Interface Specification – AVC.

2.2.2.3 Information Rate

The following traffic capacity will be carried through the **nbn**® Network without any performance objectives:

- Traffic in excess of the CIR;
- Traffic within the PIR; and

Traffic that exceeds the PIR will be discarded at ingress to the **nbn**® Network.

2.2.2.4 Peak Burst Size

The PBS defines the length of a burst of Layer 2 traffic (either in bytes or milliseconds as set out in the Network Interface Specifications) that may be received at ingress to the **nbn**® Network for a burst of traffic that pushes the average Information Rate above the configured bandwidth profile for a PIR traffic class. Traffic in excess of the PBS will be discarded by the **nbn**® Network. The PBS is set by **nbn** for each bandwidth profile, and cannot be modified.

The PBS is used by the policing functions of the **nbn**® Network at ingress to the **nbn**® Network to determine whether a stream of ingress data complies with the subscribed PIR. RSP is responsible for ensuring that all ingress traffic is shaped to comply with the PIR/PBS as specified for the required traffic class and interface, before presentation to the UNI or NNI as relevant.

2.2.3 Traffic Contention and Congestion Management

RSP may control End User experience of applications using the unicast functionality of **nbn**® Smart Places through contention applied through dimensioning of capacity between the AVC and CVC, subject to the conditions set out in the **nbn**® Smart Places Product Description.

Contention may be applied at the traffic class level, allowing RSP to independently control the economics and operation of each traffic class. This is controlled by RSP through careful dimensioning of AVC and CVC capacity, on a traffic class basis, to ensure a level of contention appropriate for each respective higher-layer application.

RSP must be aware of the implications of contending AVC and CVC components, as this will effectively degrade the performance of RSP Products and Downstream Products.

3 User Network Interface (UNI)

3.1 Overview

The **nbn**® Smart Places UNI Product Component is a UNI-SFP which:

- has a single Ethernet UNI port for the purpose of data carriage;
- is logically connected to an NNI via an AVC; and
- supports a single unicast AVC.

3.2 UNI-SFP

The UNI-SFP is an Ethernet interface in compliance with the standardization implemented for SFPs by the MSA (Multi-Source Agreement) and relevant SFP specifications.

Detailed specifications are set out in the Network Interface Specification: User Network Interface - SFP.

3.2.1 Addressing Mode

The UNI-SFP supports four interface tagging and prioritisation addressing modes for interfacing with AVCs, indicating the priority of service frames across the UNI-SFP:

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

The availability of these options for addressing services at the UNI-SFP is summarised in section 3.3 of the Network Interface Specification: User Network Interface - SFP

3.2.2 Physical Interface

nbn® Smart Places product is supplied on a GPON fibre ONT implemented as an SFP. Therefore, the physical customer facing interface for this device is the SFP electrical interface which must be implemented in the host CPE (Customer Premises Equipment) as an SFP cage which can support either 1 Gigabit per second or 2.5 Gigabit per second operation. The UNI-SFP must be associated with an active AVC at all times.

3.2.3 UNI-SFP Scalability Factors

The UNI-SFP is scalable in terms of capacity and services. Each UNI-SFP has two capacity metrics that define its ability to carry RSP Products and Downstream Products.

3.2.3.1 Line Rate

The UNI-SFP supports the following Ethernet Line Rates:

- 1000 Mbps or
- 2500 Mbps

The Line Rate sets the maximum bound on the information-carrying capacity of the link. RSP must be familiar with the inherent limitations of Ethernet in relation to the impact of framing overhead and asynchronous operation on bandwidth efficiency, and accommodate this within any capacity allocation.

The UNI-SFP will auto-negotiate the Line Rate with its host CPE to operate locally at either 1Gbps or 2.5Gbps. One active service can be configured by **nbn** to a bit rate as required by the RSP.

RSP is responsible for ensuring that the SFP-NTD is operating with a Line Rate that is sufficient to carry the requested AVC capacity, using auto-negotiation or, where available, a fixed Line Rate setting requested by RSP.

RSP is also responsible for configuring the mode of operation of the SFP-NTD.

3.2.3.2 Information Rate

A UNI-SFP can support an Information Rate up to the active Line Rate. For example,[2] a UNI-SFP that has an auto-negotiated Line Rate of 1000Mbps is capable of supporting an AVC with a PIR of 1000Mbps.

The Information Rate is also subject to the limitations described in sections 2 and 9 of the **nbn®** Smart Places Product Description. Note that once provisioned, AVC capacity will not be automatically re-adjusted as a result of changing Line Rates through auto-negotiation. Should a UNI-SFP auto-negotiate to a Line Rate less than the requested AVC rate, the End User may experience increased Frame Loss in excess of the Frame Loss targets for each traffic class on the provisioned AVC as set out in section 7.1.

3.2.4 AVC Support

The UNI-SFP functionally supports a single, bi-directional, and unicast AVC.

3.2.5 Resiliency

The UNI-SFP is an unprotected physical interface. If an unprotected UNI-SFP suffers a failure, all services being delivered across that UNI will be disrupted.

3.2.6 Smart Places – SFP-NTD

nbn will provide an SFP-NTD for use in connection with the supply of **nbn®** Smart Places, as described in section 8 of the Network Interface Specification – SFP-NTD.

The provision and operation of the SFP-NTD is the responsibility of **nbn**, with the distribution of SFP-NTDs the responsibility of RSP in the case of Self-Installations and Self-Assurance.

[2] Note that this is an illustrative example only, and does not take into account Ethernet protocol overhead.

3.2.7 RSP Smart Location Equipment Supply

The provision and operation of an active device that interfaces with the SFP-NTD on the End User side of the **nbn**® Downstream Network Boundary for **nbn**® Smart Places is the responsibility of RSP.

4 Access Virtual Circuit (AVC)

4.1.1 Overview

The AVC implements the C-VLAN component of an IEEE802.1ad Provider Bridge, as further described in the Network Interface Specification – AVC. RSP may deliver multiple End User applications (such as traffic management data and video) using a single AVC (and CoS to manage the capacity between applications).

The **nbn**® Smart Places AVC Product Component has one variant:

- Unicast 1:1 AVC – required for unicast data applications using the UNI-SFP[4]

AVCs are logically isolated from each other via the use of distinct S/C-VIDs, and are designed to be individually dimensioned by RSP from a set of selectable parameters according to the service needs of each End User.

An AVC is designed to be scaled in capacity (through its bandwidth profile), within the bounds of the product constructs and the physical limits of the Fibre Network.

4.1.2 Access Loop Identification and Characterisation

RSP may optionally order a unicast AVC to have Access Loop Identification, and where applicable, Line Characteristic information inserted into DHCPv4, DHCPv6 and PPPoE upstream Layer 3 control packets in alignment with TR-101. This may assist RSP to identify the individual logical circuit to upstream devices beyond the NNI.

AVC information that can be included is:

- Access Loop Identification – identifying an **AVC Service ID.** The **AVC Service ID** means the value configured in the Circuit ID field in the relevant DHCPv4, DHCPv6 or PPPoE protocols.
- Access Loop Characterisation – identifying **actual data rate Upstream** and **actual data rate Downstream**

Access Loop Identification insertion is available subject to the control protocol used:

Control Protocol	Fibre Network
DHCPv4	Available
DHCPv6	Available
PPPoE	Available

Detailed specifications for Access Loop Identification and Characterisation are set out in the Network Interface Specification – AVC.[3]

[3] Only one AVC, which may comprise both AVC TC- 4 and AVC TC-2, may be supplied in respect of a single UNI-SFP. Refer to Appendix A.

4.1.3 AVC Bandwidth Profile Availability

4.1.3.1 Unicast 1:1 AVC Bandwidth Profile Availability

A Unicast 1:1 AVC comprises a combination of mandatory (TC-4) and optional (TC-2) traffic classes as described in section 2.1 of the **nbn**® Smart Places Product Description subject to availability as set out in sections 2.2 and 2.3 of the **nbn**® Smart Places Product Description.

A valid Unicast 1:1 AVC bandwidth profile comprises a combination of available upstream/downstream bandwidth profiles for each traffic class as specified from the available combinations in section A.1 of Appendix A. Availability for each Unicast 1:1 AVC bandwidth profile combination is also set out in section A.1 of Appendix A.

5 Connectivity Virtual Circuit (CVC)

The CVC Product Component of **nbn**® Smart Places has the same specifications as the CVC Product Component of **nbn**® Ethernet (Fibre), which are set out in the **nbn**® Ethernet Product Technical Specifications, except as follows:

- the CVC Product Component of **nbn**® Smart Places delivers AVCs to any UNI-SFP in a single CSA;
- there is no N:1 VLAN variant;
- there is no TC-1 Traffic Class for the CVC Product of **nbn**® Smart Places; and
- references to the **nbn**® Ethernet Product Description are to be read as references to the equivalent content as set out, or referred to, in the **nbn**® Smart Places Product Description.

6 Network-Network Interface (NNI)

The NNI Product Component of **nbn**® Smart Places has the same specifications as the NNI Product Component of **nbn**® Ethernet, which are set out in the **nbn**® Ethernet Product Technical Specifications except that references to the **nbn**® Ethernet Product Description are to be read as references to the equivalent content as set out, or referred to, in the **nbn**® Smart Places Product Description.

7 Network Performance

7.1 Traffic Class Performance

nbn will aim to achieve the following standards (on an individual traffic class basis) for each traffic class:

Traffic Class	Frame Delay (One-Way)	Frame Delay Variation	Frame Loss[4]
TC-2	≤ 6msec	≤ 10msec	≤ 0.01%
TC-4	Not Applicable	Not Applicable	Not Applicable

7.2 Limitations on the Standards for Traffic Class Operations Performance

The performance of traffic class operations as specified in section 7.1 will only apply under the following conditions:

Traffic Class	Layer 2 Frame Size at NNI (Bytes)[5]	Frame Rate	CVC Traffic Class Capacity Utilisation
TC-2	1500	Periodic <=CIR	≤ 70%

Frame Delay guidance is provided between UNI and NNI distances less than 100km. In the case of UNI to NNI distance > 100km, an extra allowance of 1.4msec latency per additional 200km air path (as the crow flies) distance (or part thereof) is required.

The Layer 2 Frame Size and Frame Rate values must result in a data stream which is less than or equal to the subscribed Traffic Class CIR or any other circumstance in which the speed, performance or stability of an Ordered Product is affected by any matters set out in sections 2 and 9 of the **nbn®** Smart Places Product Description.

Each traffic class must be validated in the presence of no other traffic from other traffic classes within the AVC.

7.3 TC-4 Traffic Performance Characteristics

Traffic class 4 is designed for applications that can benefit from a peak capacity and can tolerate variable throughput. TC-4 offers capacity as a PIR.

The performance of RSP Products that use AVC TC-4s as an input will vary depending on factors both within and outside of the **nbn®** Network. RSP should use suitable higher-layer intelligent flow control mechanisms to achieve optimum results for RSP Products that use AVC TC-4s as an input.

[4] Frame Loss targets will only be met where the CBS is less than the specified limits at both the AVC and CVC level as described in section 2.2.2.2 and any applicable Network Interface Specification.

[5] Service frames are accepted up to the maximum Frame Size as described in section 3.6 of the UNI-SFP Network Interface Specification

For AVC TC-4 bandwidth profiles of 500/200 Mbps and 1000/400 Mbps offered over **nbn**® Ethernet where a 10Gbps or 100Gbps NNI is in use, an AVC peak burst in excess of 100 consecutive Ethernet frames may cause increased Frame Loss in the downstream if RSP does not use a suitable higher-layer intelligent flow control mechanism.

8 Orderable Attributes

8.1 Access Components

Access Components, for the purposes of this **nbn**® Smart Places Product Technical Specification, only comprise each instance of the UNI and AVC Product Components supplied by **nbn** to RSP to use as an input to an RSP Product or Downstream Product.

Available Product Components are tabled below:

	UNI Type	Available associated AVC
nbn® Smart Places	UNI-SFP	Unicast

Each Access Component is delivered using two sets of attributes:

- **configuration attributes** – provided through Product Templates
- **service attributes** – provided through Product Order Forms for each AVC order[6]

This section describes the Access Components in the context of configuration and service attributes.

8.1.1 Configuration Attributes

The following tables detail all AVC and UNI attributes which must be specified within a Product Template, for the delivery of the relevant Access Components.

RSP may construct its end-to-end service from a combination of these configuration attributes and service attributes selected in relation to each Ordered Product.

Certain settings required to interface to the **nbn**® Network must be decided at time of On-boarding during the solution definition phase and captured in a Product Template. These details cannot be tailored for each specific Ordered Product.

Product Templates apply to the Access Components only. Product Templates, combined with per-Ordered Product service attributes selected in a Product Order Form at time of order, are required for **nbn** to supply an Ordered Product.

8.1.1.1 UNI Configuration Attributes

The following set of configuration attributes are available for the UNI. These parameters are captured during the solution definition phase, as part of the On-boarding process.

[6] The term "service attributes" is used to describe the technical elements which are required to deliver Product Features as described in the **nbn**® Smart Places Product Description and elsewhere in this **nbn**® Smart Places Product Technical Specification.

Component	Configuration Attribute	Configuration Attribute Options
UNI	UNI Type	UNI-SFP
	VLAN Addressing Mode	Default-Mapped (UNI-SFP)
		DSCP-Mapped (UNI-SFP)
		Priority-Tagged (UNI-SFP)
		Tagged (UNI-SFP)

Table 2: UNI Configuration Attributes

8.1.1.2 AVC Configuration Attributes

The following set of configuration attributes are available for the AVC. These parameters are captured during the solution definition phase, as part of the On-boarding process.

Component	Configuration Attribute	Configuration Attribute Options
AVC	AVC Type	Unicast 1:1 (UNI-SFP)
	Bandwidth Profile	Specified from the available bandwidth profiles in section A.1 of Appendix A

Table 3: AVC Configuration Attributes

8.1.2 Service Attributes

This section describes the service attributes relating to the technical operation of the service that RSP must select for each Access Component, at the time of ordering an Ordered Product. Note that the number and type of service components will be determined by the Product Template.

8.1.2.1 Access Component Attributes

The following service attributes must be specified, where applicable, at time of order for each AVC and UNI Product Component:

Component	Service Attribute	Specification (Provided by RSP)
Access Service[7]	"Service Restoration SLA" (Service Fault rectification Service Level)	Standard (Default)
		Enhanced-12
		Enhanced-12 (24/7)
		Enhanced-8
		Enhanced-8 (24/7)

Table 4: Service Attributes for Access Service

[7] Refer to the **nbn**® Smart Places Service Levels Schedule and the **nbn**® Smart Places Product Description for details of supported service options that are available.

8.1.2.2 UNI-SFP Service Attributes

The following service attributes must be specified at time of order for the UNI-SFP:

Component	Service Attribute	Specification (Provided by RSP)
UNI-SFP	NTD UNI-SFP Port Number	0: Assigned by **nbn** (default) 1: Request Specific UNI-SFP Port on SFP-NTD (if 1 is available)
	Physical Interface	AUTO (Speed)/AUTO (Duplex)
		100Mbps/AUTO (Duplex)

Table 5: Service Attributes for UNI-SFP

8.1.2.3 Unicast AVC Service Attributes

The following service attributes must be specified at time of order for each unicast 1:1 AVC:

Component	Service Attribute	Specification (Provided by RSP)
AVC	CVC ID	CVC ID
	C-VID at NNI (1:1 AVC only)	0 – 4000[8]
	C-VID at UNI-SFP (1:1 AVC only)	2 – 4004
	Bandwidth Profile	Specified from the available unicast AVC bandwidth profiles in section A.1 of Appendix A
	Access Loop Identification Active	Active / Inactive
	Interface mode	Default-Mapped / Priority-Tagged / Tagged / DSCP Mapped

Table 6: Service Attributes for Unicast 1:1 AVC

8.1.2.4 Modification of an AVC bandwidth profile and service interruption

RSP may modify an AVC TC-4 bandwidth profile in accordance with the **nbn**® Smart Places Operations Manual. There will be a brief service interruption when the Modify Order is processed.

[8] The value of zero indicates that **nbn** will select the C-VID, and does not indicate that a C-VID of zero may be used.

8.2 CVC Service Attributes

There is no Product Template required for a CVC. Table 7 describes the set of service attributes which are generic to all CVC variants (except where called out specifically).

Component	Attributes	Attribute Description	Selectable Options
End-Point Identification	NNI Group identification[9]	Identification of the NNI that the CVC is to be terminated on.	NNI Group identification (Existing)
	B-END CSA	Identification of the CSA that the CVC is terminated on.	CSA identification
S-TAG Mapping	S-TAG (NNI)	RSP may choose a locally-significant S-TAG at the NNI. Optional parameter. If set to zero, **nbn** will assign the next available value.	Requested S-TAG (0 for **nbn**-supplied S-TAG) Default = 0 S-TAG: (1 – 4000)

Table 7: Generic CVC Service Attributes

The allocation of S/C-VID values at the NNI must be co-ordinated between RSP and **nbn**.

When requested by RSP as part of a Product Order Form for a CVC or AVC, **nbn** will allocate each new CVC/AVC an internally-generated S/C-VID. This S/C-VID value will be returned to RSP in accordance with the **nbn**® Smart Places Operations Manual, and must be used for accessing the CVC/AVC at the NNI.

RSP may optionally elect to nominate the S/C-VID used to address each CVC/AVC service instance through the NNI by specifying a S/C-VID in the Product Order Form for the CVC/AVC, for the purpose of further alignment to its own backhaul network addressing schemes. Note that RSP is encouraged to use **nbn**'s S/C-VID allocations, which will be unique to RSP's service. This will avoid any potential for S/C-VID mismatch between RSP and **nbn**.

For service addressing modes at the NNI that rely on MAC addressing for forwarding within the **nbn**® Network, the allocation of a C-VID is not required.

8.2.1 Unicast 1:1 CVC

Each unicast 1:1 CVC order must specify each of the service attributes listed in Table 8 below, in addition to those configuration attributes detailed in Table 7.

[9] Refer to section 8.3 of this **nbn**® Smart Places Product Technical Specification.

Component	Attributes	Attribute Description	Selectable Options
Bandwidth profile	Bandwidth profile	CVC_TC-2_CIR (upstream and downstream)	Refer to section A.2 of Appendix A
		CVC_TC-4_PIR (upstream and downstream)	Refer to section A.2 of Appendix A

Table 8: 1:1 Unicast CVC Additional Service Attributes

8.3 NNI Service Attributes

The attributes of the NNI Product Component of **nbn**® Smart Places are the same as the attributes of the NNI Product Component of **nbn**® Ethernet (Fibre), as set out in the **nbn**® Ethernet Product Technical Specifications.

Appendix A Traffic Class Combinations

The bandwidth profiles in this Appendix A are subject to the specifications and limitations described in this **nbn**® Smart Places Product Technical Specification and the **nbn**® Smart Places Product Description.

A.1 AVC Bandwidth Profiles

The bandwidth profile to be used for a unicast 1:1 AVC must be selected by RSP at the time of order.

					UNI-D Supported Interface Mode	
Profile Number	AVC_TC-4 (downstream)	AVC_TC-4 (Upstream)	AVC_TC-2 (Upstream, downstream)	UNI Interface	Default-Mapped (Traffic Class)	DSCP-Mapped, Priority-Tagged and Tagged
	(Mbps)	(Mbps)	(Mbps)			
8	25	10	0	UNI-SFP	4	Y
13	25	10	5	UNI-SFP	2	Y
17	50	20	0	UNI-SFP	4	Y
23	50	20	5	UNI-SFP	-	Y
29	50	20	10	UNI-SFP	2	Y
37	100	40	0	UNI-SFP	4	Y
44	100	40	5	UNI-SFP	-	Y
51	100	40	10	UNI-SFP	-	Y
58	100	40	20	UNI-SFP	2	Y
65	250	100	0	UNI-SFP	4	Y
72	250	100	5	UNI-SFP	-	Y
79	250	100	10	UNI-SFP	-	Y
86	250	100	20	UNI-SFP	-	Y
107	250	100	50	UNI-SFP	2	Y
114	500	200	0	UNI-SFP	4	Y
121	500	200	5	UNI-SFP	-	Y
128	500	200	10	UNI-SFP	-	Y
135	500	200	20	UNI-SFP	-	Y
156	500	200	50	UNI-SFP	-	Y
200	1000	400	0	UNI-SFP	4	Y
207	1000	400	5	UNI-SFP	-	Y
214	1000	400	10	UNI-SFP	-	Y
221	1000	400	20	UNI-SFP	-	Y
242	1000	400	50	UNI-SFP	-	Y

Table 9: Unicast 1:1 AVC Bandwidth Profiles - nbn® Smart Places

Notes:

- **nbn** may limit the availability of bandwidth profiles with TC-2 capacities greater than 10 Mbps in CSAs where **nbn** does not, or considers it is likely to not, have sufficient capacity to provide all requested TC-2 capacity. RSP must conduct a Site Qualification Enquiry which will indicate the availability of bandwidth profiles for TC-2 in relation to each Smart Location.

- **nbn** may limit the availability of bandwidth profiles with TC-4 capacities greater than 100 Mbps in CSAs where **nbn** does not, or considers it is likely to not, have sufficient capacity to provide all requested TC-4 capacity. RSP must conduct a Site Qualification Enquiry which will indicate the availability of bandwidth profiles for TC-4 capacities greater than 100 Mbps in relation to each Smart Places.

A.2 CVC and NNI Link Bandwidth Profiles

The bandwidth profiles available for the CVC and NNI Link Product Components of **nbn**® Smart Places are identical to the bandwidth profiles available for the CVC Product Component (TC-4 and TC-2) and NNI Link Product Feature of **nbn**® Ethernet. For a list of these available bandwidth profiles, please refer to sections B.5 and B.7 of Appendix B of the **nbn**® Ethernet Product Technical Specifications.