Product Technical Specification

nbn® BSS ILA Product Module

nbn® BSS Interim Launch Agreement

This document forms part of the nbn® BSS Interim Launch Agreement, which is a Standard Form of Access Agreement for the purposes of Part XIC of the Competition and Consumer Act 2010.

Product Technical Specification

nbn® BSS ILA Product Module

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Version	Description	Effective Date
1.0	First issued version of **nbn**® BSS Interim Launch Agreement	Execution Date
1.1	Amendments to Beam ABP, Standard QoS Max Bit Rate in respect of the Priority Queue Type	27 November 2019
1.2	Amendments relating to **nbn**® ABSL3, Disaster Recovery, QoS Marking and supply of VSAT NTDs	3 August 2020
1.3	Amendments to introduce **nbn**® Mobility VISP and **nbn**® Mobility Private Network Layer 3	15 December 2021
1.4	Amendments to update Power Supply Units for certain VSAT NTDs	4 May 2022
1.5	Amendments to update certain Charges and to introduce the Product Features, GTP Acceleration and Port Forwarding, and new bandwidth profiles	28 February 2023
1.6	Amendments to clean up Planned Items	19 May 2023
1.7	Amendments to include VLAN assignment option and GRE Acceleration, updates to GTP Acceleration availability	28 June 2023
1.8	WBA5 and other amendments	1 December 2023

Roadmap

A roadmap describing the structure of this **nbn**® BSS ILA Product Technical Specification is provided below.

1 Scope and purpose

1.1 Purpose

This **nbn**® BSS ILA Product Technical Specification sets out the technical specifications for the **nbn**® BSS Products. It forms part of the **nbn**® BSS Interim Launch Agreement.

1.2 Scope

Sections 2 to 10 of this **nbn**® BSS ILA Product Technical Specification describe the features of the **nbn**® BSS Products, as offered by **nbn** in the **nbn**® BSS Interim Launch Agreement. Any differences in availability or performance of these features between the **nbn**® BSS Products are detailed in this **nbn**® BSS ILA Product Technical Specification and the **nbn**® BSS ILA Network Interface Specification, where necessary.

1.3 Definitions

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

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

2 Introduction

2.1 The nbn® BSS Products

This section provides a brief overview of the **nbn**® BSS Products that RSP may choose to acquire:

2.1.1 nbn® BSS Products

(a) Each of the following is an **nbn**® **BSS Product**:

(i) **nbn**® Virtual Internet Service Product (**nbn**® **VISP**);

(ii) **nbn**® Internet of Things (**nbn**® **IoT**);

(iii) **nbn**® Access Bandwidth Services Layer 3 (**nbn**® **ABSL3**);

(iv) **nbn**® Mobility Virtual Internet Service Product (**nbn**® **Mobility VISP**); and

(v) **nbn**® Mobility Private Network Layer 3.

(b) Each **nbn**® BSS Product:

(i) is an Ethernet-based Layer 2 or Layer 3 virtual connection that carries traffic between a UNI-D used to serve a Premises and the **nbn**® Upstream Network Boundary as described in the following table:

nbn® BSS Product	OSI Layer	nbn® Upstream Network Boundary
nbn® VISP	Layer 3	Internet Point of Presence
nbn® IoT	Layer 3	Internet Point of Presence
nbn® ABSL3	Layer 3	• B-NNI; or • where the UNI to UNI Product Feature is applied, the Satellite Midway Point
nbn® Mobility VISP	Layer 3	Internet Point of Presence
nbn® Mobility Private Network Layer 3	Layer 3	• B-NNI • where the UNI to UNI Product Feature is applied, the Satellite Midway Point

Table 1: nbn® Upstream Network Boundary

(ii) is supplied by means of the BSS Network;

(iii) enables RSP or its Downstream Service Providers to supply a Carriage Service or Content Service to a Premises; and

(iv) comprises:

(A) Product Components, which RSP must acquire as part of that **nbn**® BSS Product; and

(B) optional Product Features, which RSP may elect to acquire,

as specified in the **nbn**® BSS ILA Product Description.

2.1.2 Product Components and Product Features

Each **nbn**® BSS Product comprises the Product Components, as described in the following table:

nbn® BSS Product	Product Components	Product Component described in
nbn® VISP **nbn**® IoT	UNI-D	Section 4
	IAC	Section 6
nbn® ABSL3	B-NNI	Section 3
	UNI-D	Section 4
	BVC	Section 5
nbn® Mobility VISP	UNI-D	Section 4
	IAC	Section 6
nbn® Mobility Private Network Layer 3	B-NNI	Section 3
	UNI-D	Section 4
	BVC	Section 5

Table 2: Product Construct

The Product Components mentioned in Table 2: Product Construct are the required components for the particular **nbn**® BSS Product. The Product Components are described below:

2.1.2.1 B-NNI (BSS Network-Network Interface)

If RSP acquires an **nbn**® ABSL3 or **nbn**® Mobility Private Network Layer 3 Ordered Product, RSP is required to connect that Ordered Product to a B-NNI, which is the connection point at a BSS POI between the RSP and the BSS Network.

See further section 3.

2.1.2.2 UNI (User Network Interface)

The UNI-D is the physical port to which the relevant **nbn**® BSS service is delivered in respect of a Premises. The UNI-D supports Layer 2 and Layer 3 configuration and can interface CPEs with LAN speeds of 10/100/1000Base-T or 100BASE-T. See further section 4.

2.1.2.3 BVC (Broadband Virtual Connection)

The BVC is the virtual connectivity component between the UNI-D and the **nbn**® Upstream Network Boundary in the BSS Network and is a mandatory Product Component of the **nbn®** ABSL3 or **nbn**® Mobility Private Network Layer 3 Product. RSP is not required to order BVC separately as part of ordering an **nbn®** ABSL3 or **nbn**® Mobility Private Network Layer 3 Product. It will be allocated by **nbn** with the Product Features selected by the RSP, when ordering the **nbn®** ABSL3 or **nbn**® Mobility Private Network Layer 3 Product. See further section 5.

BVC is defined by its Information Rate (expressed as a bandwidth profile) on the Forward and Return links of the relevant **nbn**® ABSL3 or **nbn**® Mobility Private Network Layer 3 Product and additionally, in the case of **nbn**® Mobility Private Network Layer 3, the data usage allowance.

The mandatory or optional orderable Product Features listed in Table 3 relate to the BVC component when the RSP orders a **nbn®** ABSL3 or **nbn®** Mobility Private Network Layer 3 Product. See further section 2.1.3 for all available Product Features.

Feature	Mandatory/Optional	Feature described in Section
Information Rate bandwidth profile (CIR/PIR)	Mandatory	Section 5.2
Burst	Optional[1]	Section 8.2
UNI to UNI	Optional[1, 2, 3]	Section 5.4
Bandwidth on Demand (BoD)	Optional[1]	Section 8.4
Disaster Recovery (DR)	Optional[3]	Section 8.5
Encryption	Optional[1, 2, 3]	Section 8.6
Time of Day Service (ToD)	Optional[1]	Section 8.10
VoIP Prioritisation	Optional[1, 2, 3]	Section 8.11
Quality of Service (QoS) Marking	Optional[1, 2, 3]	Section 8.9
PEP (TCP & HTTP Acceleration)	Optional[1, 2, 3]	Section 8.8
ABP (CIR/PIR)	Optional[1]	Section 8.1
GTP Acceleration	Optional[1, 2, 3]	Section 8.13
GRE Acceleration	Optional[1, 2, 3]	Section 8.14

Table 3: BVC Product Component

[1] Available for **nbn®** ABSL3 (Uncontended).

[2] Available for **nbn®** ABSL3 (Contended).

[3] Available for **nbn®** Mobility Private Network Layer 3.

2.1.2.4 IAC (Internet Access Connection)

The IAC is the virtual connectivity component between the UNI-D and the Internet Point of Presence and is a mandatory Product Component of **nbn®** VISP, **nbn®** IoT and **nbn®** Mobility VISP Products. RSP is not required to order IAC separately as part of ordering an **nbn®** VISP, **nbn®** IoT or **nbn®** Mobility VISP Product. It will be allocated with the Product Features selected by the RSP, when ordering **nbn®** VISP, **nbn®** IoT or **nbn®** Mobility VISP. See further section 6.

For **nbn®** VISP and **nbn®** Mobility VISP, IAC is defined by the Information Rate (expressed as a bandwidth profile) on the Forward and Return links and the data usage allowance. For **nbn®** IoT, IAC is defined by the Information Rate (expressed as a bandwidth profile) on the Forward and Return links.

The mandatory or optional orderable Product Features listed in Table 4 relate to the IAC component when the RSP orders an **nbn®** VISP, **nbn®** IoT or **nbn®** Mobility VISP Product. See further section 2.1.3 for all available Product Features.

Feature	Mandatory/Optional	Feature described in Section
PEP (TCP & HTTP Acceleration)	Optional[1, 2, 3]	Section 8.8
Data usage allowance (in GB)	Mandatory for **nbn®** VISP and **nbn®** Mobility VISP	Section 6.3
Information Rate bandwidth profile (CIR/PIR)	Mandatory	Section 6.2
Disaster Recovery (DR)	Optional[1, 3]	Section 8.5
VoIP Prioritisation	Optional[1, 3]	Section 8.11
Fleet Plan	Optional[1]	Section 8.7

Encryption	Optional[1, 2, 3]	Section 8.6
ABP (PIR)	Optional[2]	Section 8.1
QoS Marking	Optional[1, 2, 3]	Section 8.9
Port Forwarding	Optional[1, 2, 3]	Section 8.12
GTP Acceleration	Optional[1]	Section 8.13
GRE Acceleration	Optional[1]	Section 8.14

Table 4: IAC Product Component

[1] Available for **nbn**® VISP.

[2] Available for **nbn**® IoT.

[3] Available for **nbn**® Mobility VISP.

2.1.3 Product Features

Each **nbn**® BSS Product comprises the optional Product Features, which RSP may elect to acquire, as described in the following table:

Each **nbn**® BSS Product comprises the optional Product Features, which RSP may elect to acquire, as described in the following table:

Optional Product Feature	Optional Product Feature described in	**nbn**® BSS Product				
		nbn® VISP	**nbn**® IoT	**nbn**® ABSL3	**nbn**® Mobility VISP	**nbn**® Mobility Private Network Layer 3
Access Bandwidth Pool (ABP)	Section 8.1	✖	✓	✓(1)	✖	✖
Additional VLANs	Section 8.3	✖	✖	✓	✖	✓
Bandwidth on Demand (BoD)	Section 8.4	✖	✖	✓(1)	✖	✖
B-NNI Redundancy Mode	Section 3.2	✖	✖	✓	✖	✓
Burst	Section 8.2	✖	✖	✓(1)	✖	✖
Disaster Recovery (DR)	Section 8.5	✓	✖	✖	✓	✓
Encryption	Section 8.6	✓	✓	✓	✓	✓
Fleet Plan	Section 8.7	✓	✖	✖	✖	✖
Performance Enhancing Proxy (PEP)	Section 8.8	✓	✓	✓	✓	✓
Quality of Service (QoS) Marking	Section 8.9	✓	✓	✓	✓	✓
Time of Day (ToD)	Section 8.10	✖	✖	✓(1)	✖	✖
UNI to UNI	Section 5.4	✖	✖	✓	✖	✓
VoIP Prioritisation	Section 8.11	✓	✖	✓	✓	✓

Optional Product Feature	Optional Product Feature described in	**nbn**® BSS Product				
		nbn® VISP	**nbn**® IoT	**nbn**® ABSL3	**nbn**® Mobility VISP	**nbn**® Mobility Private Network Layer 3
Port Forwarding	Section 8.12	✓	✓	✖	✓	✖
GTP Acceleration	Section 8.13	✓	✖	✓	✖	✓
Generic Routing Encapsulation (GRE) Acceleration	Section 8.14	✓	✖	✓	✖	✓

Table 5 Optional Product Features

***Note**: (1) Not available with **nbn**® ABSL3 (Contended).*

2.2 Access Components

Available Access Components are tabled below:

nbn® BSS Product	UNI Type
nbn® VISP	UNI-D, IAC
nbn® IoT	UNI-D, IAC
nbn® ABSL3	UNI-D, BVC
nbn® Mobility VISP	UNI-D, IAC
nbn® Mobility Private Network Layer 3	UNI-D, BVC

Table 6 Available Access Components

Each Access Component is delivered using two sets of attributes:

- Configuration attributes configured at On-boarding or as subsequently agreed by **nbn** and RSP, for all of RSP's services of the relevant type
- Service attributes – selected by RSP on a service-by-service basis with each order for a service

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

3 BSS Network-Network Interface (B-NNI)

Section 3 of the **nbn**® BSS ILA Product Description describes the B-NNI Product Component and the B-NNI Bearers. This section provides further product-level specification of the B-NNI Bearers, B-NNI Redundancy mode and BVC support characteristics of the B-NNI Product Component.

- B-NNIs associated with an **nbn**® ABSL3 or **nbn**® Mobility Private Network Layer 3 service will support BGP and static routes at the B-NNI to exchange route information with the RSP.

Detailed network-level specifications are set out in the **nbn**® BSS ILA Network Interface Specification.

3.1 B-NNI Bearers

Physical interface options for a B-NNI Bearer are:

- 1000BaseLX
- 1000BaseEX
- 10GBaseLR
- 10GBaseER

3.2 B-NNI Redundancy mode

The B-NNI must be configured in one of the following redundancy modes. All B-NNI Bearers in redundancy configuration must have the same B-NNI Bearer profile interface rate:

Redundancy Mode	B-NNI Bearer profile interface rate
Single Interface (Single BSS POI)	1G
	10G
Redundant Interface (Single BSS POI)	1G
	10G
Single Interface (Redundant BSS POI)	1G
	10G
Redundant Interface (Redundant BSS POI)	1G
	10G

Table 7 Redundancy Mode

RSP initiates traffic flow from the UNI-D through to the B-NNI. The inflow and out flow between the UNI-D and the B-NNI will be defined by the routing specified by the RSP. Where a redundancy mode is selected, **nbn** will route the traffic to the redundant path should there be a failure or interruption of the service. This is managed

by **nbn** routing. This can be in respect of B-NNIs at one BSS POI or in respect of B-NNIs at different BSS POIs subject to the redundancy configuration selected by the RSP and the type of the failure or interruption.

3.2.1 Single Interface (Single BSS POI)

When a B-NNI is configured with no B-NNI redundancy, the B-NNI Bearer will be provisioned with a single B-NNI interface (1G or 10G) at the BSS POI selected by RSP. If the B-NNI fails, traffic may be dropped.

3.2.2 Redundant Interface (Single BSS POI)

When a B-NNI is configured as Redundant Interface (Single BSS POI), redundant B-NNI Bearers will each be provisioned at the BSS POI selected by RSP.

The B-NNI Bearers will operate in a 1:1 protection mode, meaning that if the primary B-NNI Bearer fails, traffic will be re-directed to the other B-NNI Bearer.

3.2.3 Single Interface (Redundant BSS POI)

When a B-NNI is configured as Single Interface (Redundant BSS POI), a single B-NNI Bearer will be provisioned at each BSS POI.

The B-NNI Bearers will operate in a 1:1 protection mode, meaning that if the primary B-NNI Bearer fails, traffic will be re-directed to the other B-NNI Bearer at the other BSS POI.

Note:

- It is the RSP's responsibility to arrange backhaul from the RSP Network to each BSS POI and manage RSP's network orchestration between the two B-NNI Bearers in the case of failover.

3.2.4 Redundant Interface (Redundant BSS POI)

When a B-NNI is configured as Redundant Interface (Redundant BSS POI), 2 B-NNI Bearers will be provisioned at each BSS POI.

For **nbn**® ABSL3 and **nbn**® Mobility Private Network Layer 3, the B-NNIs may operate in Active-Standby or Active-Active configuration. RSP can choose and control the active B-NNIs and determine failover conditions (e.g. where a B-NNI at one site is unavailable) and load balancing (i.e. sharing traffic between two or more B-NNIs) using BGP.

Notes:

1. *It is the responsibility of the RSP to configure its routers to manage failover and load balancing with **nbn**® ABSL3 and **nbn**® Mobility Private Network Layer 3.*
2. *It is the RSP's responsibility to arrange backhaul from RSP's network to each BSS POI and manage RSP's network orchestration between the four B-NNI Bearers to manage all failovers.*

Redundancy Mode	BSS POI location	Number of Interfaces	B-NNI operation (nbn® ABSL3)[2]
Single Interface (Single BSS POI)	EAST or WEST	1	N/A
Redundant Interface (Single BSS POI)	EAST or WEST	2	Active-Standby OR Active-Active[1]
Single Interface (Redundant BSS POI)	EAST and WEST	2 (1 per BSS POI)	Active-Standby OR Active-Active[1]

Redundancy Mode	BSS POI location	Number of Interfaces	B-NNI operation (nbn® ABSL3)[2]
Redundant Interface (Redundant BSS POI)	EAST and WEST	4 (2 per BSS POI)	Active-Standby OR Active-Active[1]

Table 8 B-NNI Redundancy modes

Note:

1. *To be configured by RSP at their discretion using BGP attributes which will be defined and agreed between **nbn** and RSP during Solution Design Workshops.*
2. *For **nbn**® ABSL3 and **nbn**® Mobility Private Network Layer 3, where RSP acquires Single Interface (Redundant BSS POI) or Redundant Interface (Redundant BSS POI), it will be the RSP's responsibility to use BGP local-preference and AS-Path features to automate and orchestrate the BGP failover between BSS POIs.*

3.3 BVC Support

The B-NNI will transparently support the BSS Traffic Class and priority encoding/decoding model set out in section 8.9, as detailed further in section 4.5 of the **nbn**® BSS ILA Network Interface Specification.

3.4 Layer 3 Protocol Support

3.4.1 nbn® ABSL3 and nbn® Mobility Private Network Layer 3

BGP protocol (RFC 4271) is used to interface to the RSP Network across the B-NNI and receive routing updates from the network. A 'static' route is subject to agreement between RSP and **nbn** at a Solution Design Workshop. The Solution Design Workshop will be held for both **nbn** and the RSP to jointly understand customer experience required and configuration capabilities provided by the **nbn**® BSS Product to provide an end-to-end solution to seek to meet RSP requirements.

3.5 Orderable B-NNI Attributes

B-NNI has the following orderable attributes.

3.5.1 B-NNI

The B-NNI has the following attributes:

- Location
- Interface rate
- Redundancy mode
- Set of B-NNI Bearers
- Layer 2 or Layer 3 functional characteristics

3.5.1.1 B-NNI Redundancy Mode

The B-NNI can be configured in one of the following redundancy modes:

- Single Interface (Single BSS POI)
- Redundant Interface (Single BSS POI)

- Single Interface (Redundant BSS POI)
- Redundant Interface (Redundant BSS POI)

In order to change the redundancy mode of a B-NNI, RSP must order a new B-NNI in the intended redundancy mode and transition existing BVCs from the previous B-NNI. Once completed, the previous B-NNI may be cancelled.

3.5.1.2 B-NNI Orderable Attributes Summary

Component	Attributes	Attribute Description	Selectable Options
Service details	Physical Location	Physical location of B-NNI	BSS POI Site (EAST or WEST)
B-NNI Attributes	Redundancy Mode	Physical interface type	Single Interface (Single BSS POI) (default)
			Redundant Interface (Single BSS POI)
			Single Interface (Redundant BSS POI)
			Redundant Interface (Redundant BSS POI)

Table 9 B-NNI Orderable Attributes

3.5.2 B-NNI Bearer

3.5.2.1 B-NNI Bearer Ordering

B-NNI Bearers are ordered through a B-NNI.

A feasibility check will be required upon addition of any B-NNI Bearer to a B-NNI, to determine whether the number of allowable B-NNI Bearers within the B-NNI has been exceeded.

nbn initially provisions each completed B-NNI Bearer order to RSP in an administratively "down" state. **nbn** will change this to an "up" state in co-ordination with RSP.

The following activities may be performed on a B-NNI, with respect to the set of B-NNI Bearers:

- establish a new B-NNI through ordering at least one B-NNI Bearer (Single Interface) or at least one pair of B-NNI Bearers (Redundant Interface)
- modify an existing B-NNI through adding/removing B-NNI Bearer(s)
- cancel an existing B-NNI– all underlying B-NNI Bearers will be automatically cancelled

For B-NNI configured as Single Interface (Single BSS POI or Redundant BSS POI), B-NNI Bearers may be ordered as single interfaces.

For B-NNI configured as Redundant Interface (Single BSS POI or Redundant BSS POI), B-NNI Bearers must be ordered in pairs.

***Note: nbn** intends to schedule an Outage with RSP to augment the B-NNI with additional B-NNI Bearers unless **nbn** notifies RSP that an Outage is not necessary.*

3.5.2.2 B-NNI Bearer Orderable Attributes

Component	Attributes	Attribute Description	Selectable Options
Service details	B-NNI	The B-NNI to which the B-NNI Bearer is intended to be	B-NNI identification

		associated	
B-NNI Bearer	Type	Physical interface type	1000BaseLX
			1000BaseEX
			10GBaseLR
			10GBaseER

Table 10 B-NNI Bearer Service Attributes

RSP must separately acquire the necessary facilities access rights to connect the B-NNI Bearer to RSP's backhaul transmission cables or RSP Active Equipment.

4 User Network Interface (UNI-D)

4.1 Overview

The UNI-D is an Ethernet interface port on the VSAT NTD for the purposes of data carriage. It is the downstream physical demarcation point which separates the responsibility of the RSP from that of **nbn**. Each UNI-D will be assigned to a single service operating in total isolation from any other UNI-D and the RSP may deliver one service over that UNI-D.

UNI-D is compliant with IEEE 802.3 standards. Each UNI-D is regarded as a fully independent interface, operating in total isolation from any other UNI-D residing on the same VSAT NTD. The aggregate of all UNI-D throughput Information Rates on a VSAT NTD cannot exceed the relevant VSAT NTD throughput limit set out in the **nbn**® BSS ILA Product Description and in the **nbn**® BSS ILA Network Interface Specification.

In respect of **nbn®** VISP, **nbn®** IoT and **nbn**® Mobility VISP, each UNI-D is logically connected to the Internet Point of Presence via an IAC. In respect of **nbn®** ABSL3 and **nbn**® Mobility Private Network Layer 3, each UNI-D is logically connected via a BVC to a B-NNI, and to the Satellite Midway Point if UNI-to-UNI configuration applies.

The UNI-D will be associated with an active IAC (for **nbn**® VISP, **nbn**® IoT or **nbn**® Mobility VISP Products), or an active BVC (for **nbn**® ABSL3 or **nbn**® Mobility Private Network Layer 3 Products), as the case may be, at all times.

Note: Only one UNI-D port can be active and provisioned per VSAT NTD. Any additional UNI-D ports on a VSAT NTD are for **nbn**'s management and troubleshooting use and will not be available for RSP traffic.

4.2 Addressing Mode

The UNI-D supports a number of interface tagging, prioritisation addressing, and Quality of Service mapping modes as described in the **nbn**® BSS ILA Network Interface Specification.

***Note**: Not all addressing modes are available in respect of all **nbn**® BSS Products.*

4.2.1 VSAT NTD IP Addressing Modes

The following VSAT NTD IP addressing modes are supported:

nbn® BSS Product	NAT Mode	Route Mode	Subnet provided by
nbn® VISP	✓ default mode	✓	**nbn**
nbn® IoT	✓ default mode	✓	**nbn** / RSP*
nbn® ABSL3	×	✓ default mode	RSP
nbn® Mobility VISP	✓ default mode	✓	**nbn**
nbn® Mobility Private Network Layer 3	×	✓ default mode	RSP

Table 11 Available IP addressing modes for each nbn® BSS Product

***Note:** RSP can only provide the subnet in respect of **nbn**® IoT where RSP acquires an ABP in respect of IoT IACs. In these circumstances, the IPv4 public IP subnet is to be provided by RSP for the ABP supplied in respect of **nbn**® IoT IACs. The minimum acceptable subnet is a /23.*

Two VSAT NTD IP addressing modes are supported, for **nbn**® VISP, **nbn**® IoT and **nbn**® Mobility VISP Ordered Products. RSP will have the option of selecting NAT (default mode) or Route Mode of UNI-D IP address allocation.

Only one VSAT NTD IP addressing mode is supported for **nbn®** ABSL3 and **nbn®** Mobility Private Network Layer 3 Ordered Products which is the Route Mode (default mode) and the subnet must be supplied by RSP.

- **nbn-supplied subnet – NAT mode**: This mode is supported by **nbn**® VISP, **nbn**® IoT and **nbn**® Mobility VISP. By default, the internet facing IP address of **nbn**® VISP, **nbn**® IoT and **nbn**® Mobility VISP is allocated with a **nbn** supplied unique single static usable public IPv4. Any RSP Equipment connected to the active UNI-D will use NAT for translating the single public **nbn**® allocated IP to an RSP facing private /24 IP subnet.

  The RSP facing IP range subnet used for NAT is set at the time of ordering. This IP subnet is to the RSP Equipment or End User Equipment via DHCP (Example - 192.168.99.0/24). This subnet can be changed by the RSP. DHCP is enabled by default at the time of ordering and cannot be disabled.

- **nbn-supplied subnet – Route mode**: This mode is supported by **nbn®** VISP, **nbn®** IoT and **nbn**® Mobility VISP Ordered Products. If Route Mode is selected by the RSP at the time of ordering for an **nbn**® VISP, **nbn**® IoT or **nbn**® Mobility VISP Ordered Product, RSP can select the following option for an **nbn** supplied public IP subnet: 2 IPv4 addresses (1 usable by RSP, 1 allocated to UNI-D as the default gateway) for **nbn**® IoT, **nbn**® VISP and **nbn**® Mobility VISP.

  The RSP usable IP addresses can be allocated to RSP Equipment or End User Equipment either dynamically using DHCP by the VSAT IDU or statically assigned by RSP via manual configuration. DHCP can be enabled or disabled by the RSP, at the time of ordering. RSP must tag the traffic before it reaches the UNI-D with VLAN 99 in order for it to be correctly routed to the Internet.

- **RSP-supplied subnet – Route mode**: Route mode is the default mode for **nbn®** ABSL3 and **nbn®** Mobility Private Network Layer 3 Ordered Products and cannot be altered. **nbn** will provision these services with an IP address range (subnet) that is supplied by the RSP. **nbn®** will not supply an IP address range.

  The RSP supplied IP range (subnet) can be private or public.

  The RSP usable IP addresses can be allocated to RSP Equipment or End-User Equipment either dynamically using DHCP by the VSAT IDU or statically assigned by the RSP via manual configuration. DHCP can be enabled or disabled by the RSP, at the time of ordering. The VSAT IDU supports dynamic routing protocol RIPv2 as well as static routing between UNI-D and RSP Equipment or End User Equipment.

The particulars of the IP address provisioned in respect of a UNI-D depends on the applicable **nbn**® BSS Product and the functionality requested by RSP.

nbn® BSS Product	Networking mode	IP Address type	Number of IP Addresses allocated to UNI-D	Number of public IP Addresses usable by RSP	Number of private IP Addresses usable by RSP
nbn® VISP	NAT	IPv4/IPv6[1]	1	N/A	253
nbn® VISP	Route	IPv4/IPv6[1]	2	1	N/A
nbn® IoT	NAT	IPv4/IPv6[1]	1	N/A	253
nbn® IoT	Route	IPv4/IPv6[1]	2	1	N/A
nbn® ABSL3	Route	IPv4/IPv6[1]	RSP-supplied		
nbn® Mobility VISP	NAT	IPv4/IPv6[1]	1	N/A	253
nbn® Mobility VISP	Route	IPv4/IPv6[1]	2	1	N/A
nbn® Mobility Private	Route	IPv4/IPv6[1]	RSP-supplied		

nbn® BSS Product	Networking mode	IP Address type	Number of IP Addresses allocated to UNI-D	Number of public IP Addresses usable by RSP	Number of private IP Addresses usable by RSP
Network Layer 3					

Table 12 IP Addressing NAT/Route

Notes:

1. *IPv6 addressing is planned to be made available at a date notified by **nbn**.*

4.3 Physical Interface

The physical interface is an electrical RJ-45 port on the VSAT NTD. Only one port is available for RSP traffic. Other ports that may exist on the VSAT NTD can only be used by **nbn** for management and troubleshooting purposes.

The following interface modes are available via the UNI-D:

- 10/100/1000BASE-T (electrical, auto-negotiated speed, and full/half-duplex)
- 100BASE-T (electrical, fixed speed, auto-negotiated full/half-duplex)

The particulars of the UNI that **nbn** makes available in respect of a Premises depends on the **nbn**® BSS Product used to serve the Premises, the functionality requested by RSP and the type of Premises:

nbn® BSS Product	Type of UNI	Port	Location of UNI port	Number of ports on VSAT NTD
nbn® VISP	UNI-D	Ethernet	VSAT NTD	1 (VSAT NTD Set 2, VSAT NTD Set 4, and VSAT NTD Set 6) or 4 (VSAT NTD Set 1 and VSAT NTD Set 5)[1]
nbn® IoT	UNI-D	Ethernet	VSAT NTD	1 (VSAT NTD Set 3 or VSAT NTD Set 7)
nbn® ABSL3	UNI-D	Ethernet	VSAT NTD	4[1] (VSAT NTD Set 1 and VSAT NTD Set 5)
nbn® Mobility VISP	UNI-D	Ethernet	VSAT NTD	4[1] (VSAT NTD Fly Away, VSAT NTD Drive Away, VSAT NTD Land Mobile, VSAT NTD Maritime Mobile)
nbn® Mobility Private Network Layer 3	UNI-D	Ethernet	VSAT NTD	4[1] (VSAT NTD Fly Away, VSAT NTD Drive Away, VSAT NTD Land Mobile, VSAT NTD Maritime Mobile)

Table 13 UNI port availability on VSAT NTD

Note:

1. *Although VSAT NTD Set 1, VSAT NTD Set 5, VSAT NTD Fly Away, VSAT NTD Drive Away, VSAT NTD Land Mobile and VSAT NTD Maritime Mobile are physically equipped with 4 UNI-D ports, only 1 UNI-D port is available for use with an **nbn**® BSS Ordered Product.*

4.4 Scalability Factors

The UNI-D is scalable in terms of capacity (Line Rate) and services (Information Rate). Each UNI-D has two capacity metrics that define its ability to carry RSP and Downstream Products, as follows:

4.4.1 Line Rate

The Line Rate sets the maximum limit on the information-carrying capacity of the link. The 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 as described in the **nbn**® BSS ILA Network Interface Specification.

The UNI-D supports the following Ethernet Line Rates:

- 10Mbps
- 100Mbps
- 1000Mbps

The UNI-D can be configured to auto-negotiate the Line Rate with the End User Equipment attached to the UNI-D or to a fixed Line Rate requested by the RSP.

RSP is responsible for ensuring that the UNI-D is operating with a Line Rate that is enough to carry the requested IAC and BVC bandwidths in respect of **nbn**® BSS Ordered Products, using the auto-negotiated or the set fixed Line Rate, as applicable.

The UNI-D will be configured in Full Duplex mode by default.

4.4.2 Information Rate

The Layer 2 Information Rate as it applies to the UNI-D, if converted to a Layer 1 rate, is bounded by the Line Rate of the UNI-D. The Information Rate is also subject to the limitations described in section 27 of the **nbn**® BSS ILA Product Description. Note that once provisioned, the capacity (IAC or BVC) will not be automatically re-adjusted as a result of changing Line Rates through auto-negotiation. UNI-D auto-negotiation to a Line Rate less than the requested rate (IAC or BVC) may result in the End User experiencing increased Frame Loss in excess of the Frame Loss targets for each BSS Traffic Class of the provisioned IAC or BVC , as set out in Section 9 (Service Performance).

Note: Information Rate and availability of the Ordered Product is also subject to the limitations described in the **nbn**® BSS ILA Product Description.

4.5 IAC and BVC Support

For **nbn**® VISP, **nbn**® IoT and **nbn**® Mobility VISP, the UNI-D supports a single, bi-directional, unicast IAC.

For **nbn**® ABSL3 and **nbn**® Mobility Private Network Layer 3, the UNI-D supports a single, bi-directional, unicast BVC.

4.6 Resilience

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

4.7 VSAT NTD Supply

nbn will supply VSAT NTDs suitable for operation with each **nbn**® BSS Product and based on RSP requirements.

The VSAT NTD includes the following **nbn** approved elements:

- An outdoor unit (ODU), being the transceiver and the antenna; and
- An indoor unit (IDU), being the modem.

The following table lists examples of VSAT NTD sets for each **nbn**® BSS Product for the purpose of demonstrating possible configurations of an Ordered Product and is not intended to be an exhaustive description of the Ordered Product configurations available to RSP.

VSAT NTD variant	nbn® BSS Product
VSAT NTD SET 1	**nbn**® ABSL3 **nbn**® VISP (30/13Mbps, 13/13Mbps)
VSAT NTD SET 2	**nbn**® VISP (30/1Mbps, 30/5 Mbps, 50/5 Mbps, 100/10 Mbps and VISP Max)
VSAT NTD SET 3	**nbn**® IoT (up to 2/2 Mbps)
VSAT NTD SET 4	**nbn**® VISP (30/1Mbps, 30/5 Mbps, 50/5 Mbps, 100/10 Mbps and VISP Max)
VSAT NTD SET 5	**nbn**® ABSL3 **nbn**® VISP High Gain (for beam edge applications)
VSAT NTD SET 6	**nbn**® VISP (30/1Mbps, 30/5 Mbps, 50/5 Mbps, 100/10 Mbps and VISP Max)
VSAT NTD SET 7	**nbn**® IoT (up to 2/2 Mbps)
VSAT NTD Fly Away	**nbn**® Mobility VISP (30/5 Mbps) **nbn**® Mobility Private Network Layer 3 (30/5 Mbps)
VSAT NTD Drive Away	**nbn**® Mobility VISP (30/5 Mbps) **nbn**® Mobility Private Network Layer 3 (30/5 Mbps)
VSAT NTD Land Mobile	**nbn**® Mobility VISP (30/5 Mbps) **nbn**® Mobility Private Network Layer 3 (30/5 Mbps)
VSAT NTD Maritime Mobile	**nbn**® Mobility VISP (30/5 Mbps) **nbn**® Mobility Private Network Layer 3 (30/5 Mbps)

Table 14 VSAT NTD Variants

The following table lists the standard components and specifications of each VSAT NTD set listed in Table 14.

Item	Antenna	Modem	Transceiver	Power Supply	Power Cable	Licence
VSAT NTD Set 1	Antenna 1.2M KA CIR CLS-I	SKYEDGE II-c CAPRICORN-4	XCVR KA 4W T29.4-30 R19.2-20.2	24V 2.5A 120W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn**

Item	Antenna	Modem	Transceiver	Power Supply	Power Cable	Licence
VSAT NTD Set 2	Antenna 0.74M KA CIR CLS-I + Mount XCVR bracket (Top Pole) LNC00497	SKYEDGE II-c GEMINI IDU	XCVR KA 2.5W T29.4-30 R19.2-20.2	24V 2.5A 72W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn**
VSAT NTD Set 3	Antenna 0.74M KA CIR CLS-I + Mount XCVR bracket (Top Pole) LNC00497	SKYEDGE II-c GEMINI IDU	XCVR KA 2.5W T29.4-30 R19.2-20.2	24V 2.5A 72W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn**
VSAT NTD Set 4	Antenna 1.2M KA CIR CLS-I	SKYEDGE II-c GEMINI IDU	XCVR KA 4W T29.4-30 R19.2-20.2	24V 2.5A 72W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn**
VSAT NTD Set 5	Antenna 1.8M KA CIR CLS-I	SKYEDGE II-c CAPRICORN-4	XCVR KA 4W T29.4-30 R19.2-20.2	24V 2.5A 120W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn**
VSAT NTD Set 6	Antenna 0.74M KA CIR CLS-I + Mount XCVR bracket (Top Pole) LNC00497	SKYEDGE II-c GEMINI IDU	XCVR KA 4W T29.4-30 R19.2-20.2	24V 2.5A 72W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn**
VSAT NTD Set 7	Antenna 0.74M KA CIR CLS-I + Mount XCVR bracket (Top Pole) LNC00497	SKYEDGE II-c GEMINI IDU	XCVR KA 4W T29.4-30 R19.2-20.2	24V 2.5A 72W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn**
VSAT NTD Fly Away	0.74m transportable antenna and 74G mount	SKYEDGE II-c CAPRICORN-4	XCVR KA 4W T29.4-30 R19.2-20.2	24V 2.5A 120W Desktop Power Supply[3]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn** and mobility license
VSAT NTD Drive Away	0.98mvehicle-mounted antenna and 98G mount	SKYEDGE II-c CAPRICORN-PRO	XCVR KA 4W T29.4-30 R19.2-20.2	Capricorn 4 Pro 2x24V DC Power Supply	Power Cable 3m DC	Suitable VSAT licence as determined by **nbn** and mobility license
VSAT NTD Land Mobile	SR-300 vehicle mounted antenna and mount	Taurus COTM IDU	Integrated KA transceiver	Taurus Modem 24V DC Power Supply	Power Cable 3m DC	Suitable VSAT licence as determined by **nbn** and mobility license
VSAT NTD Maritime Mobile	Maritime 1.0m 3-axis stabilised antenna and mount	SKYEDGE II-c CAPRICORN-4	Integrated KA transceiver	24V 2.5A 120W Desktop Power Supply[2]	CABLE POWER 250V/10A 1.8M AU GROUNDED	Suitable VSAT licence as determined by **nbn** and mobility license

Table 15 VSAT NTD Components

Notes:

1. *The particulars of the VSAT NTD that **nbn** makes available in respect of a Premises depends on the **nbn**® BSS Product used to serve the Premises, the functionality requested by the RSP and the location and type of Premises.*
2. *Versions of this VSAT-NTD to which this note applies which were dispatched before 4 May 2022 may be supplied with a 60W Power Supply Unit.*
3. *Versions of this VSAT-NTD to which this note applies which were dispatched before 4 May 2022 may be supplied with a 70W Power Supply Unit.*

VSAT NTDs are designed to operate within certain environmental conditions, which are set out in the **nbn**® BSS ILA Network Interface Specification. If a VSAT NTD is subjected to environmental conditions outside those expressly permitted, **nbn**® BSS Ordered Products supplied using the VSAT NTD may not perform in accordance with the **nbn**® BSS ILA Product Description or this **nbn**® BSS ILA Product Technical Specification.

4.7.1 VSAT Mounting Equipment

Except for VSAT NTDs provided in connection with **nbn**® Mobility VISP or **nbn**® Mobility Private Network Layer 3, **nbn** will make available to RSP a range of mounting equipment for VSAT NTDs (**VSAT Mounting Equipment**). The details and specifications of such VSAT Mounting Equipment are summarised in Schedule A and may be updated from time to time.

4.8 Orderable UNI-D Attributes

The UNI-D has the following orderable attributes.

4.8.1 Configuration Attributes

Configuration attributes are captured during On-boarding. The following set of configuration attributes are available for the UNI-D.

Component	Service Attribute	Specification (Provided by RSP if multiple options)
UNI	UNI Type	UNI-D
	VLAN Addressing Mode	Default-Mapped DSCP-Mapped Priority-Tagged Tagged
	VLAN assignment	For **nbn**® ABSL3 only: 1-to-1 1-to-many
	Physical Interface	10/100/1000BASE-T (electrical, auto-negotiated speed and full/half-duplex) 100BASE-T (electrical, fixed speed, auto-negotiated full/half-duplex)
	Line Rate (1,2)	10Mbps 100Mbps 1000Mbps

Table 16: UNI-D Configuration Attributes

5 Broadband Virtual Connection (BVC)

5.1 Overview

The BVC is the virtual connectivity component between the UNI-D and the **nbn**® Upstream Network Boundary in respect of **nbn®** ABSL3 and **nbn®** Mobility Private Network Layer 3. **nbn** will provision the BVC in respect of each **nbn®** ABSL3 and **nbn®** Mobility Private Network Layer 3 Ordered Product. The BVC will be configured by **nbn** with the orderable attributes and Product Features selected by RSP, as described further in this section 5. RSP is not required to order BVC separately as part of ordering an **nbn**® ABSL3 or **nbn®** Mobility Private Network Layer 3 Ordered Product. It will be allocated with the Product Features selected by the RSP when ordering.

For **nbn**® ABSL3 and **nbn®** Mobility Private Network Layer 3, Service VLAN tag (S-TAG) is assigned to a BVC via the **nbn**® BSS Portal. All BVCs with the same S-TAG will be logically connected on the same VLAN. Hence, for all BVCs with the same S-TAG, RSP can establish a UNI-to-UNI communication without traversing the B-NNI, provided the sites maintain distinct (not overlapping) network subnets to enable routing between them. Isolation between End Users on **nbn®** ABSL3, or on **nbn®** Mobility Private Network Layer 3, will be achieved by having different S-TAGs (= VLANs) assigned to different BVCs.

RSP may request additional S-TAGs, which they can select from the S-TAG pool and allocate to the End User via the **nbn**® BSS Portal.

Note: If RSP wishes to partition traffic on a BVC supplied to a Contracted End User using different VLANs (S-TAGs), such solution will need to be discussed with **nbn** and agreed as part of Solution Design Workshops.

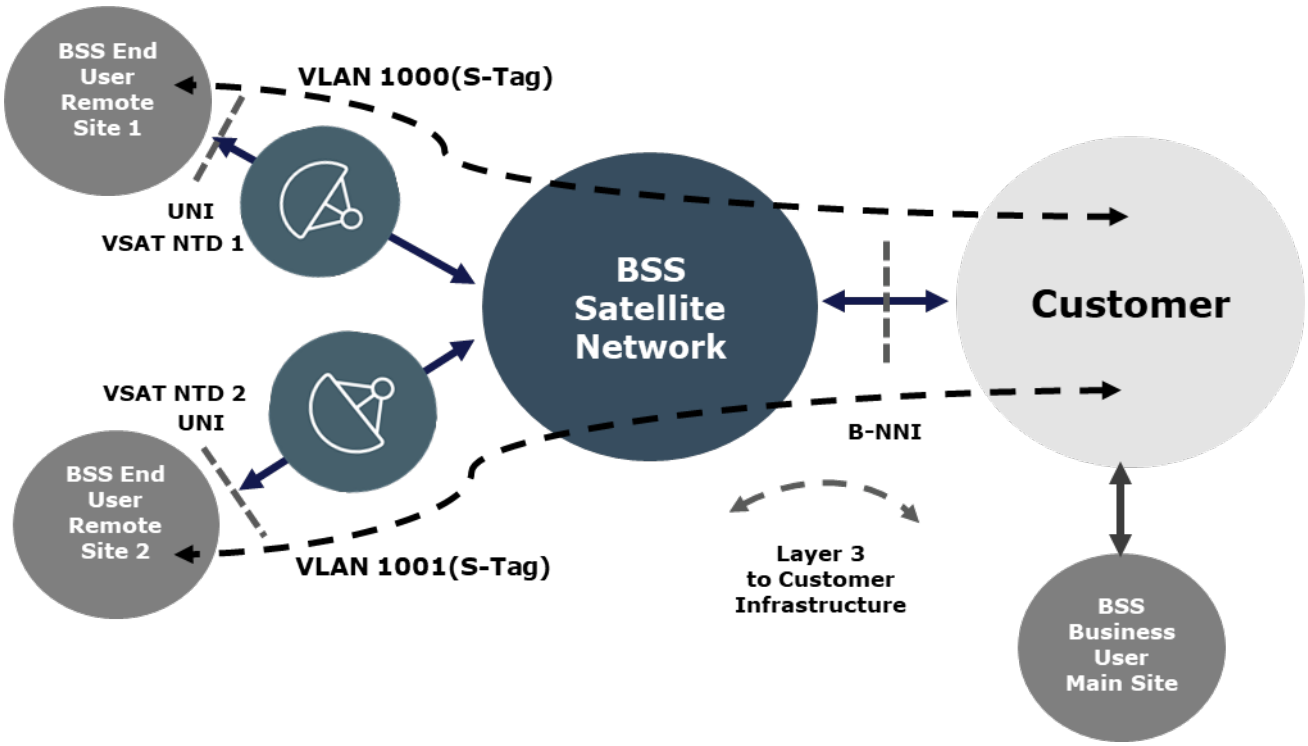

Figure 1: BVC Architecture for nbn® ABSL3 and nbn® Mobility Private Network Layer 3

A BVC is designed to be scaled in capacity (through its Information Rate), within the bounds of the product constructs and the physical limits of the BSS Network.

5.2 Information Rate Bandwidth Profile

BVC bandwidth profiles may be selected by RSP in the bandwidth profiles described in the **nbn**® BSS ILA Product Description.

5.3 VLANs

VLANs may be used to associate one or more End User sites with a shared common network within the RSP's network.

For each **nbn®** ABSL3 and **nbn**® Mobility Private Network Layer 3 Ordered Product, an S-TAG (= VLAN) is configured by **nbn** and will be used to identify traffic entering the BSS Network at the UNI-D. All traffic will flow between the UNI-D and the B-NNI.

A BVC used for an **nbn**® ABSL3 Ordered Product can support 1-to-1 or 1-to-many VLAN mapping (in this section, **VLAN Assignment**). RSP may choose the following mapping options to match its operational model:

- 1-to-1 mapping, where a single VLAN assigned to a UNI (**downstream-facing VLAN**) on the BSS Network is mapped to a single VLAN that is visible at the B-NNI (**upstream-facing VLAN**) with the same ID in the RSP Network; or
- 1-to-many mapping, where a single downstream-facing VLAN on the BSS Network is mapped to multiple upstream-facing VLANs for handoff to the RSP Network.

In the case of 1-to-1 mapping, **nbn** may limit the number of VLANs allocated to RSP based on capacity constraints of the BSS Network.

Further details of the VLAN Assignment options are set out at section 5.3.1 of the **nbn**® BSS ILA Network Interface Specification.

Additional VLANs (S-TAG and C-TAG) may be ordered to logically partition traffic from different End User sites. For more information, refer Section 8.3 Additional VLANs.

5.4 UNI to UNI

For **nbn®** ABSL3 and **nbn**® Mobility Private Network Layer 3, all provisioned services belonging to the same RSP will be on the same S-TAG (= VLAN) by default. In UNI-to-UNI configuration, the BVC will be configured to enable traffic to be carried between UNI-Ds belonging to different **nbn®** ABSL3 or **nbn**® Mobility Private Network Layer 3 Ordered Products of that RSP without traversing the B-NNI, as described in section 20 of the **nbn®** BSS ILA Product Description.

Traffic entering one UNI-D (in this section 5.4, the **A-end Component**) that is to be routed to another UNI-D designated by RSP (in this section 5.4, the **B-end Component**) will be assigned identical VLAN-TAGs. In any configuration, the number of B-end Components which an A-end Component can have is limited by VLAN and IP addressing.

BVCs configured in accordance with this section 5.4 will also allow traffic to be handed off to RSP at the B-NNI. The BSS Network will analyse traffic entering the BSS Network from the UNI-D and route to the appropriate B-end Component or to the B-NNI, based on the header information and VLAN Tags (as the case may be).

Under this scenario, more than one **nbn®** ABSL3 or **nbn**® Mobility Private Network Layer 3 service can share the same S-TAG (= VLAN). The user traffic is multipoint to multipoint, i.e. between UNI and the B-NNI as well as UNI to UNI. If these services require any direct communications, the traffic is routed directly from UNI to UNI with VLAN configuration settings, without exiting the B-NNI, as managed by RSP.

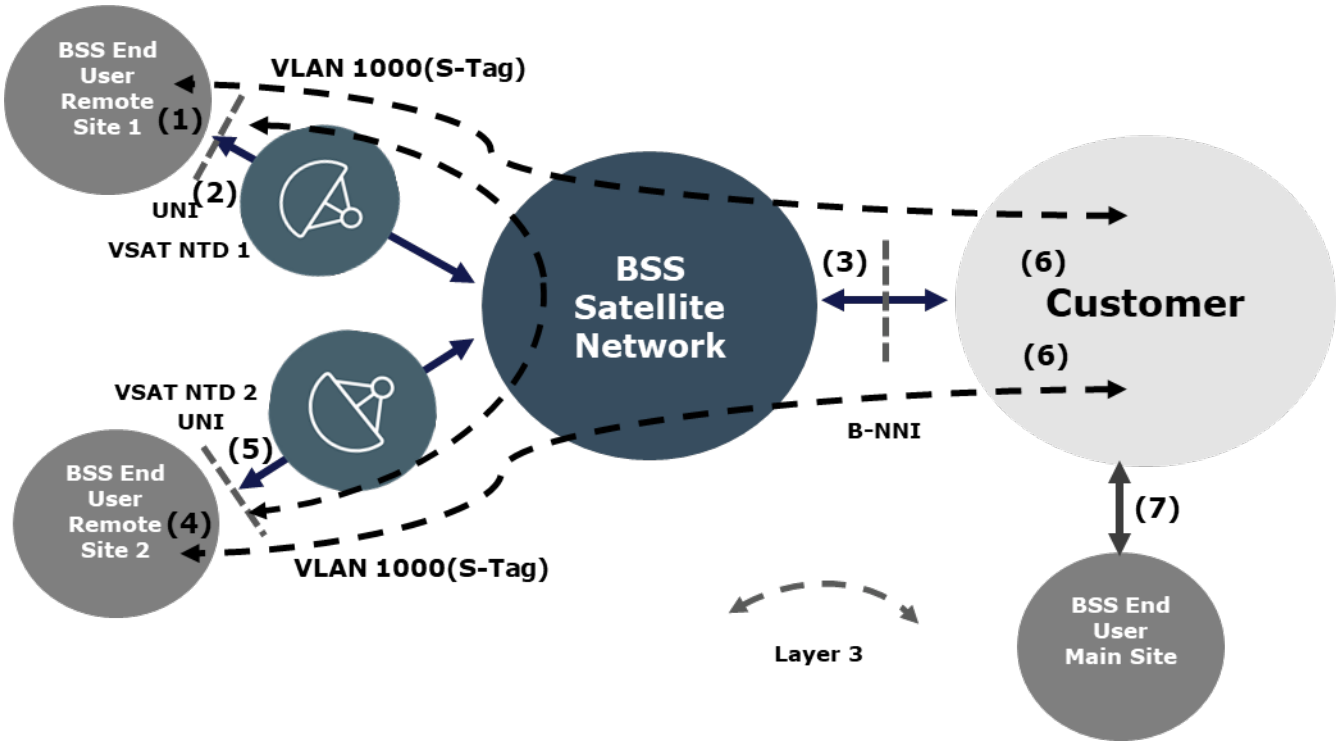

Figure 2: UNI to UNI

5.5 Data Usage Allowance

Packets traversing a BVC in respect of an **nbn®** Mobility Private Network Layer 3 Ordered Product are subject to a data usage allowance profile, selectable by RSP. Usage is calculated for both Forward (downstream) and Return (upstream) paths by **nbn** at the east and west gateway in the BSS Network.

For any **nbn®** Mobility Private Network Layer 3 Ordered Product where a data usage allowance applies, encrypted overhead to the payload is excluded from calculation of any data usage.

The VSAT NTD and DPS are responsible for encryption key management which is transparent to the End User. AES encryption over the air adds on average 12.5 bytes header to the data packet. See further section 8.6.

5.6 Orderable BVC Attributes

BVC has the following orderable attributes.

5.6.1 BVC Configuration Attributes

The following set of configuration attributes are available for the UNI-D and, where applicable, the B-NNI, and are captured during Solution Design Workshop:

Component	Service Attribute	Specification (Provided by RSP)
BVC	UNI-UNI configuration	No (Default) Yes
BVC	VLAN assignment	For **nbn**® ABSL3 only: 1-to-1 1-to-many

Table 17 BVC Configuration Attributes

5.6.2 BVC Service Attributes

The following BVC service attributes must be specified at the time of ordering:

Component	Service Attribute	Specification (Provided by RSP)
BVC	BVC ID	Assigned by **nbn**
	End-Point Identification	B-NNI (Existing) B-end UNI (UNI-UNI configuration only).
	VLAN assignment	For **nbn**® ABSL3 only (default depends on the option selected by RSP during Solution Design Workshop): 1-to-1 1-to-many
	Bandwidth profile	Default = BW selected from available unicast BVC bandwidth profile options/increments Burst (**nbn**® ABSL3 (Uncontended) only): Selected from available Burst Options with minimum ordered CIR bandwidth BoD (**nbn**® ABSL3 (Uncontended) only): Selected from available BoD bandwidth profile options ToD (**nbn**® ABSL3 (Uncontended) only): Profile 1 BW and Profile 2 BW selected from available BVC bandwidth profile options/increments
	Data usage allowance (**nbn**® Mobility Private Network Layer 3 only)	Default = 100GB Selected from available BVC data usage allowance options / increments DR: Selected from available DR data usage allowance options / increments
	Terminal Profile (**nbn**® Mobility Private Network Layer 3 only)	Comms-on-the-pause Comms-on-the-move
	ABP	Default = Off ABP Bandwidth selected from available ABP bandwidth options / increments (**nbn**® ABSL3 (Uncontended) only)
	QoS Marking (BSS Traffic Class)	Default = none QoS Profile 1 (**nbn**® ABSL3 (Uncontended) only) QoS Profile 2 (**nbn**® ABSL3 (Uncontended) only) QoS Profile 3 QoS Profile Customised (**nbn**® ABSL3 (Uncontended) only)

Component	Service Attribute	Specification (Provided by RSP)
	PEP optimisation	On (Default) Off
	Encryption	Off (Default) On
	VoIP Prioritisation (**nbn**® ABSL3 only)	Off (Default) On
	GTP Acceleration	On (Default) Off
	GRE Acceleration	On (Default) Off

Table 18 Service Attributes for BVC

Notes:

1. *If RSP selects Burst the ABP must be Off*
2. *For any **nbn**® ABSL3 or **nbn**® Mobility Private Network Layer 3 Ordered Product where a data usage allowance applies, encryption overhead to the payload is included in calculations of any data usage.*

6 Internet Access Connection (IAC)

6.1 Overview

The IAC is the virtual connectivity component between the UNI-D and the Internet Point of Presence in respect of **nbn**® VISP, **nbn**® IoT and **nbn**® Mobility VISP. **nbn** will provision the IAC in respect of each **nbn®** VISP, **nbn**® IoT and **nbn**® Mobility VISP Ordered Product with the orderable attributes and Product Features selected by RSP, as described further in this Section 6.

All RSP traffic for **nbn**® VISP, **nbn**® IoT and **nbn**® Mobility VISP is carried with identical VLAN TAGs managed by **nbn**. **nbn** will assign public IP addresses, as further described above in section 4.1. Figure 3 illustrates the traffic flow from each UNI-D.

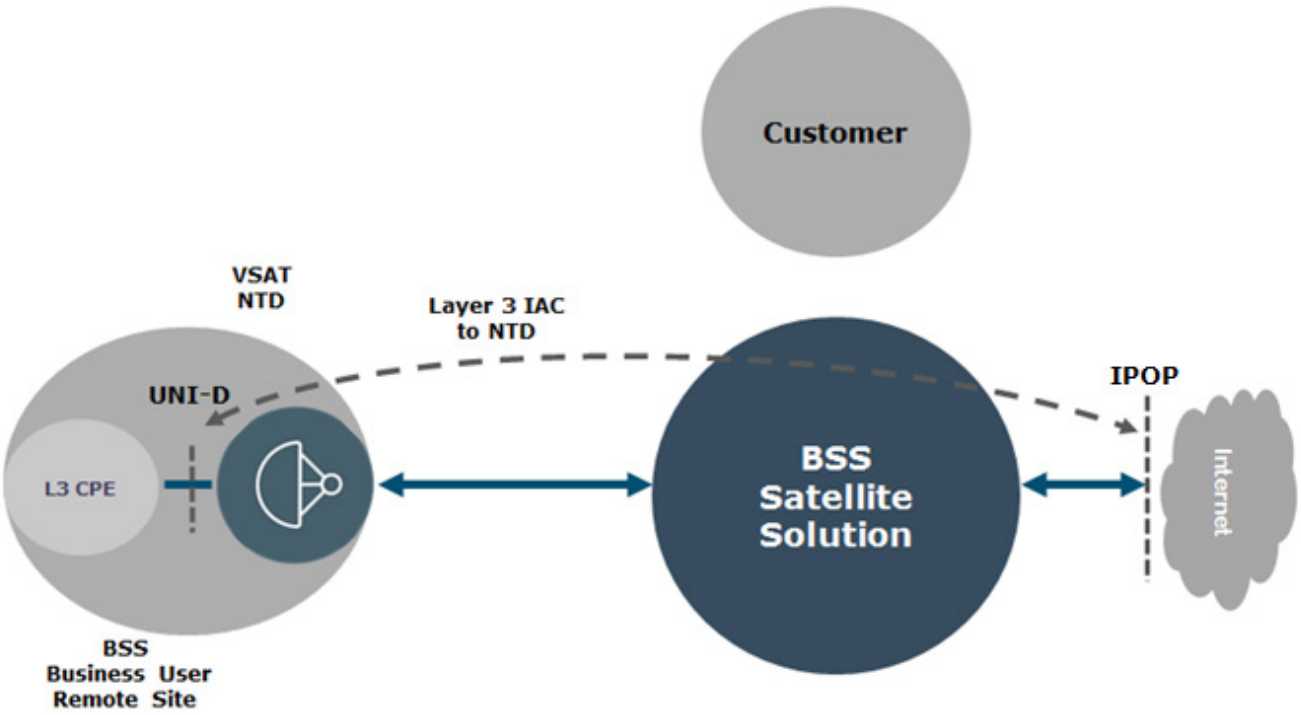

Figure 3: Traffic flow along the IAC

Tagging is further described in the **nbn**® BSS ILA Network Interface Specification.

6.2 Information Rate Bandwidth Profile

IAC bandwidth profiles may be selected by RSP in the bandwidth profiles described in the **nbn**® BSS ILA Product Description.

6.3 Data Usage Allowance

Packets traversing an IAC in respect of an **nbn®** VISP Ordered Product are subject to a data usage allowance profile, selectable by RSP. Usage is calculated for both Forward (downstream) and Return (upstream) paths by **nbn** at the east and west gateway in the BSS Network.

For any **nbn**® VISP or **nbn**® Mobility VISP Ordered Product where a data usage allowance applies, encrypted overhead to the payload is excluded from calculation of any data usage.

The VSAT NTD and DPS are responsible for encryption key management which is transparent to the End User. AES encryption over the air adds on average 12.5 bytes header to the data packet. See further section 8.6.

6.4 Orderable IAC Attributes

IAC has the following orderable attributes.

6.4.1 IAC Configuration Attributes

The following set of configuration attributes are available for the IAC. These parameters are captured during On-boarding:

Component	Service Attribute	Specification (Provided by RSP)
IAC	Physical Interface	10/100/1000BASE-T (electrical, auto-negotiated speed and full/half-duplex) 100BASE-T (electrical, fixed speed, auto-negotiated full/half-duplex)
	Line Rate	10Mbps 100Mbps 1000Mbps

Table 19: IAC Configuration Attributes

6.4.2 IAC Service Attributes

The following IAC service attributes must be specified at the time of order:

Component	Service Attribute	Specification (Provided by RSP)
IAC	IAC ID	Assigned by **nbn**
	Bandwidth profile	Default = BW selected from available unicast IAC bandwidth options / increments Burst (**nbn**® IoT only): Selected from available Burst Options with minimum ordered CIR bandwidth DR: Selected from available DR bandwidth profile options / increments (**nbn**® VISP and **nbn**® Mobility VISP only)
	ABP (**nbn**® IoT only)	Default = Off ABP Bandwidth selected from available ABP bandwidth options / increments
	QoS Marking (BSS Traffic Class)	Default = none QoS Profile 3
	Data usage allowance (**nbn**® VISP and **nbn**® Mobility VISP only)	Default = 100GB Selected from available IAC data usage allowance options / increments DR: Selected from available DR data usage allowance options / increments
	Terminal profile (**nbn**® Mobility VISP only)	Comms-on-the-pause Comms-on-the-move

Component	Service Attribute	Specification (Provided by RSP)
	Fleet Plan (**nbn**® VISP only)	Off (Default) Fleet Plan Members Fleet Plan Bandwidth
	PEP optimisation	On (Default) Off
	Encryption	Off (Default) On
	VoIP Prioritisation (**nbn**® VISP and **nbn**® Mobility VISP only)	Off (Default) On
	Port Forwarding	Off (Default) On
	GTP Acceleration	For **nbn**® VISP only: On (Default) Off
	GRE Acceleration	For **nbn**® VISP only: On (Default) Off

Table 20 Service Attributes for IAC

7 Other Service Attributes

7.1 VSAT NTD Attributes

The following service attributes must be specified by RSP where a new VSAT NTD is required:

Component	Service Attribute	Specification	
		Input power options	Output power
VSAT NTD Set 1	Power Supply 1	AC (240V) (Default) DC (24V) DC (48V)	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Set 2	Power Supply 1	AC (240V) (Default) DC (24V) DC (48V)	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Set 3	Power Supply 1	AC (240V) (Default) DC (24V) DC (48V)	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Set 4	Power Supply 1	AC (240V) (Default) DC (24V) DC (48V)	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Set 5	Power Supply 1	AC (240V) (Default) DC (24V) DC (48V)	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Set 6	Power Supply 1	AC (240V) (Default) DC (24V) DC (48V)	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Set 7	Power Supply 1	AC (240V) (Default) DC (24V) DC (48V)	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Fly Away	Power Supply 1	RSP defined	DC (24V)
	Solar power	RSP defined	DC (24V)
VSAT NTD Drive Away	Power Supply 1	RSP defined	DC (48V)

Component	Service Attribute	Specification	
		Input power options	Output power
	Solar power	n/a	n/a
VSAT NTD Land Mobile	Power Supply 1	RSP defined	DC (48V)
	Solar power	n/a	n/a
VSAT NTD Maritime Mobile	Power Supply 1	RSP defined	DC (48V)
	Solar power	n/a	n/a

Table 21 Service Attributes for VSAT NTD

Upon request from RSP, **nbn** may supply a standard DC interface cable to interface the VSAT NTD with the RSP provided DC power solution. Further information is provided in the **nbn**® BSS ILA Network Interface Specification.

7.2 VSAT NTD SNMP Management Information Base (MIB) and Polling of MIB Object Identifiers (OID)

The VSAT NTDs support Simple Network Management Protocol (SNMP) version 2 (SNMPv2).

The community string available to RSP for the VSAT NTDs SNMPv2 MIB may only be used in read only mode and the "Get" function may only be used to retrieve restricted subset of OIDs from the MIB.

Notes:

1. Refer to the BSS Operations User Guide for details of the available VSAT NTD MIB OIDs;
2. Where RSP queries the VSAT NTD MIB the read only polling function must be limited to no more than 1 poll every 5 min and for sequential gets of MIB OIDs of no more than 20 ("Get" function) OIDs per 5min interval; and
3. Use of the MIB "Walk" function is prohibited and if used will void **nbn** SLA agreement and may void the NTD warranty.
   Support requests as a result of not following the above guidelines will not be prioritised and will be attended by **nbn** operations as best effort.

8 Product Features

A number of Product Features will be made available to RSP, the availability of which is determined in accordance with the **nbn**® BSS ILA Product Description.

8.1 Access Bandwidth Pool (ABP)

Access Bandwidth Pool allows RSP to order a pool of bandwidth that can be allocated (in respect of any CIR bandwidth) or shared on a contended basis (in respect of any PIR bandwidth) across multiple Ordered Products (ABP Members). RSP can manage contention between the Ordered Products (ABP Members) which operate in the same ABP, thus enabling better efficiency in respect of bandwidth utilisation. The ABP Product Feature applies only to the eligible **nbn**® BSS Products; **nbn**® IoT and **nbn**® ABSL3 (Uncontended).

Each ABP will only service one type of **nbn**® BSS Product. Separate ABPs are required for each type of **nbn**® BSS Product set, **nbn**® IoT or **nbn**® ASBL3 (Uncontended) respectively. The ABP must be ordered separately (established), ahead of or at the time of purchasing the Ordered Products that will be operating within the ABP.

RSP may order ABP capacity for use in either a single Beam or multiple designated Beams. The selected Beams define the RSP's ordered ABP coverage area. The Beams define the geographical areas to which Ordered Products in an ABP can be supplied. The ABP must be configured with a common QoS Marking (if selected) and is reported as a single block of capacity.

Note: all services in the ABP must operate the same QoS Marking.

Dedicated CIR bandwidth will be delivered using bandwidth allocated in respect of RSP in a Beam. PIR bandwidth will be delivered using bandwidth shared between RSP and Other RSPs (and managed by **nbn**).

The following table summarises various ABP options per **nbn**® BSS Product.

nbn® BSS Product	CIR	PIR
nbn® ABSL3 ABP[1]	✓	✓
nbn® IoT ABP	✗	✓

Table 22: Bandwidth Pool Options Per nbn® BSS Product

***Note**: (1) Not available with **nbn**® ABSL3 (Contended).*

8.1.1 Beam ABP

RSP can operate a Beam ABP using capacity in a single Beam or multiple Beams, subject to the following:

a. a Beam ABP may be established in respect of one or more Beams;

b. each Beam in a Beam ABP is an independent entity for bandwidth allocation and contention purposes;

c. in respect of an ABP provisioned in respect of **nbn**® ABSL3 (Uncontended) Ordered Products, a Beam ABP requires each Beam having assigned CIR bandwidth greater than 0 Mbps and optional PIR bandwidth(with the Maximum Information Rate for that Beam in that ABP being the greater of the ordered CIR bandwidth (if any), and any ordered PIR bandwidth, in respect of that Beam);

d. in respect of an **nbn**® IoT ABP, a Beam ABP only supports PIR bandwidth in respect of a particular Beam (and, for clarity, the PIR bandwidth for a Beam in the **nbn**® IoT ABP will also be considered the Maximum Information Rate for that Beam in the **nbn**® IoT ABP); and

e. the bandwidth in a Beam cannot be shared between ABP Members in other Beams within the Beam ABP.

Note: ABP operating as capacity for a group of services across a number of Beams is planned to be made available at a date notified by **nbn**.

RSP may separately order **nbn**® BSS Ordered Products in a single Beam within the ABP. Each of the Ordered Products in the ABP will have their own bandwidth profile of CIR (in respect of **nbn**® ABSL3 (Uncontended) ABP Members) and PIR as may be configured by RSP in accordance with section 7 of the **nbn**® BSS ILA Product Description. RSP will be able to allocate any CIR bandwidth, or share any PIR bandwidth on a contended basis (as the case may be), ordered in a Beam ABP between the ABP Members operating in that Beam.

If more than one Ordered Product is in operation in a single Beam within an ABP, those Ordered Products will be allocated any CIR bandwidth, or share any PIR bandwidth on a contended basis (as the case may be), within the Beam bandwidth in that ABP. RSP is responsible for managing the dimensioning of capacity, and bandwidth contention (if applicable), between the ABP Members within a Beam.

A sample use case of RSP operating a Beam ABP for a Contracted End User with two site locations each in a different Beam. In addition to any other reporting that is available to RSP, ABP Members will also be reported and visible as a single instance for service level reporting purposes, in accordance with any standard processes determined by **nbn** from time to time. If more than one ABP Member is in operation in the same Beam, then any ordered CIR and PIR bandwidth will be allocated or shared on a contended basis, respectively as the case may be, between these ABP Members based on the predefined profile determined for each ABP Member by the RSP. The RSP is responsible for the bandwidth contention ratio and performance of the services sharing the bandwidth in each Beam.

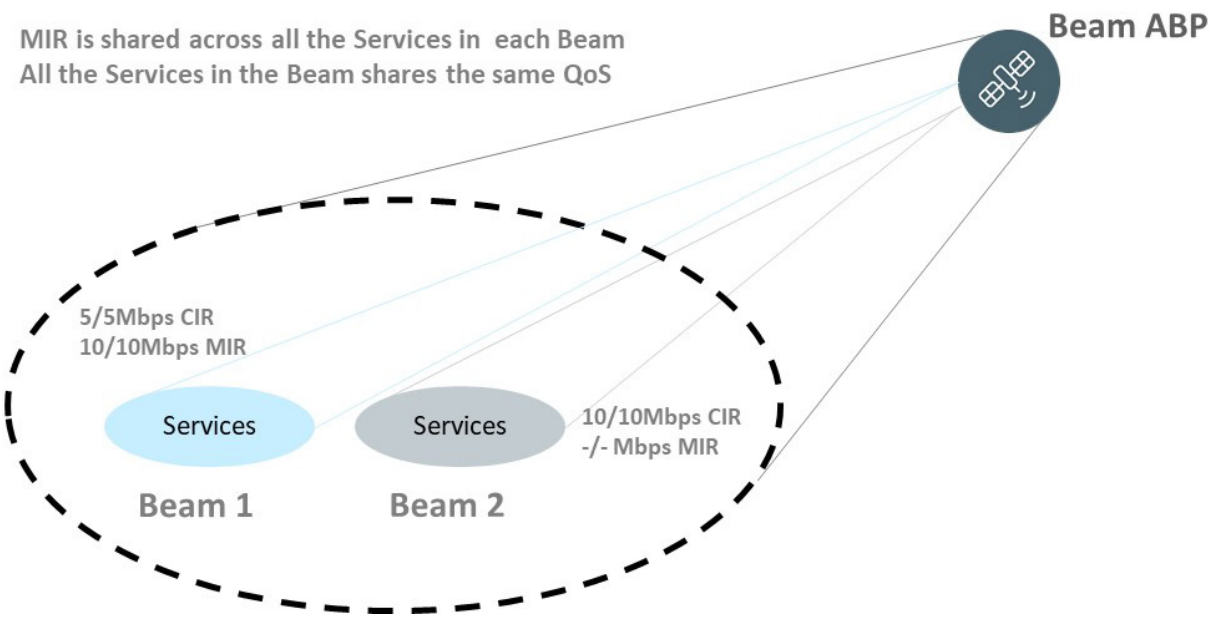

Figure 4: Beam Bandwidth Pools

The example of a Beam ABP in Figure 4 shows an RSP defined Beam ABP which operates across two Beams in the same Beam ABP. The RSP has ordered 5/5 Mbps of CIR bandwidth for Beam 1. If RSP also orders an additional 10/10 Mbps of PIR in Beam 1, it will result in a total of 10/10 Mbps MIR. Any ABP Members in Beam 1 have access to the CIR and access to the additional PIR depending on how the capacity is allocated or shared on a contended basis (as the case may be) to the VSAT NTDs in Beam 1.

In Beam 2 of the Beam ABP the RSP has ordered CIR of 10/10Mbps. No additional PIR capacity has been ordered for Beam 2. In this instance the CIR is capacity that is always available to be allocated between ABP Members located in Beam 2. As no PIR has been ordered in Beam 2 of the ABP, the ABP Members do not have access to ABP PIR so the MIR is equal to the CIR of 10/10Mbps.

8.2 Burst

Burst is an optional Product Feature of the BVC Product Component only in respect of **nbn**® ABSL3 (Uncontended).

Burst provides an **nbn**® ABSL3 BVC Ordered Product at predefined CIR thresholds the limited ability to burst above its CIR in accordance with the associated Burst profiles, on a best efforts basis.

The Burst profiles and thresholds are:

Burst Profile	Maximum Burst achievable PIR (Mbps)
Profile 1	10 PIRF
Profile 2	20 PIRF
Profile 3	50 PIRF
Profile 4	100 PIRF
Profile 5	150 PIRF
Profile 6	175 PIRF*
Profile 7	200 PIRF*
Profile 8	5 PIRR
Profile 9	10 PIRR
Profile 10	15 PIRR

Table 23: Burst profiles and thresholds

*****_These options will only be available on and from the relevant Commercial Launch Date._

8.3 Additional VLANs

Additional VLANs enable RSP to logically separate traffic from different End User sites.

Each **nbn**® ABSL3 BVC and **nbn**® Mobility Private Network Layer 3 BVC is configured with a single VLAN. In this construct VLAN (S-TAG) can represent a group of End User sites (of the same enterprise) such that all these sites are logically partitioned from other traffic generated by other End Users of the same RSP. The RSP may order up to 4 additional VLANs for each such group of End User sites.

8.4 Bandwidth on Demand (BoD)

When the RSP orders the BoD Product Feature via the **nbn**® BSS Portal as part of the BVC associated with an **nbn**® ABSL3 (Uncontended) Ordered Product, it will be provisioned on the BVC with a minimal throughput (e.g. 10Kbps) only to ensure keep alive messages. This minimum throughput for keep alive messages will not have an RSP-visible profile. RSP must explicitly trigger a Demand Event, unless otherwise configured in accordance

with the standard processes determined by **nbn** from time to time. RSP must only use the service during minimum throughput status to monitor service availability.

Note: The profile change is carried out on-the-fly (**OTF**) on the VSAT NTD to respond to a Demand Event if the Demand Event is set as a recurring daily activity with the exact same service profile parameters. An OTF profile change for BoD may take up to 10 seconds to complete.

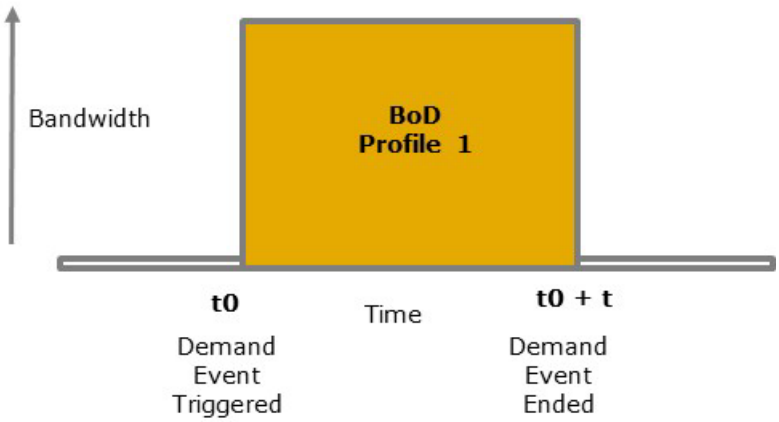

Figure 5: Example BoD configuration

8.5 Disaster Recovery (DR)

The DR Product Feature provides the ability to deliver an **nbn®** VISP, **nbn®** Mobility VISP and **nbn®** Mobility Private Network Layer 3 service for occasional use. DR has two alternative modes of operation:

1. Seamless Mode – For **nbn®** VISP, **nbn®** Mobility VISP or **nbn®** Mobility Private Network Layer 3, where RSP may immediately access IAC bandwidth (refer to Section 13.2 of the **nbn®** BSS ILA Product Description); and
2. Manual Mode - For **nbn®** VISP, where RSP must explicitly trigger a Disaster Event to access the full DR bandwidth profile. When the RSP orders DR via the **nbn®** BSS Portal as part of the IAC Product Component associated with an **nbn®** VISP Ordered Product, it will be provisioned on the IAC with a minimal throughput (no more than 10Kbps) only to monitor the Service availability. This minimum throughput to monitor service availability will not have an RSP-visible profile (refer to Section 13.2 of the **nbn®** BSS ILA Product Description).

Note: The profile change from minimum throughput to full DR capacity occurs without further input from the RSP. For Manual Mode, once the change has been initiated by **nbn** Personnel, there may be a delay of several seconds before the full DR bandwidth profile takes effect.

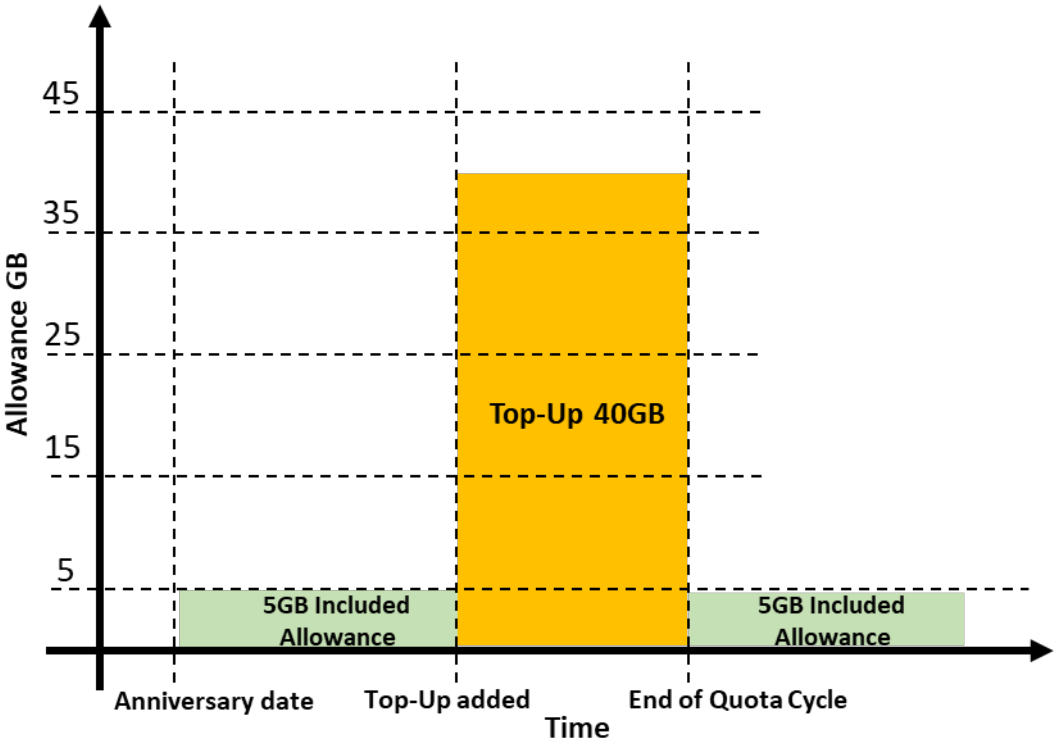

Figure 6: Example DR Seamless Mode configuration for nbn® VISP

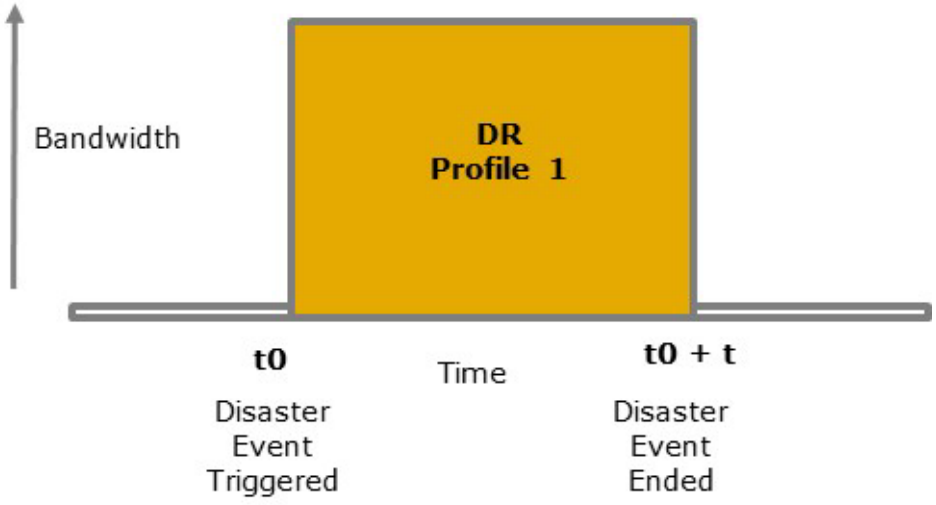

Figure 7: Example DR Manual Mode configuration

8.6 Encryption

Encryption takes place over-the-air (**OTA**) using Advanced Encryption Standard with 256 bits (AES-256) and is Decrypted at the VSAT NTD and at the DPS. The OTA encryption is applied to traffic carried between the VSAT NTD and the DPS. The VSAT NTD and DPS are responsible for the encryption key management, which is transparent to the end user. The traffic between the DPS and B-NNI is not encrypted by **nbn**.

If Encryption is enabled on an **nbn®** BSS Product, there will be an overhead imposed by **nbn** that will detract from allocated BVC and IAC bandwidth in respect of that **nbn®** BSS Ordered Product. On average, Encryption over the air adds a 12.5-byte header to the data packet.

Traffic that is transmitted by the VSAT NTD over the satellite link is encrypted. The traffic is decrypted by the DPS. Traffic that is received by the DPS to be transmitted to the UNI-D, is encrypted by the DPS before it is transmitted over the satellite link. On the VSAT NTD side the traffic is decrypted before egress at the UNI-D.

The encryption algorithm is applied to the final payload after all other acceleration algorithms (e.g. PEP) are applied before transmission in either direction over the air.

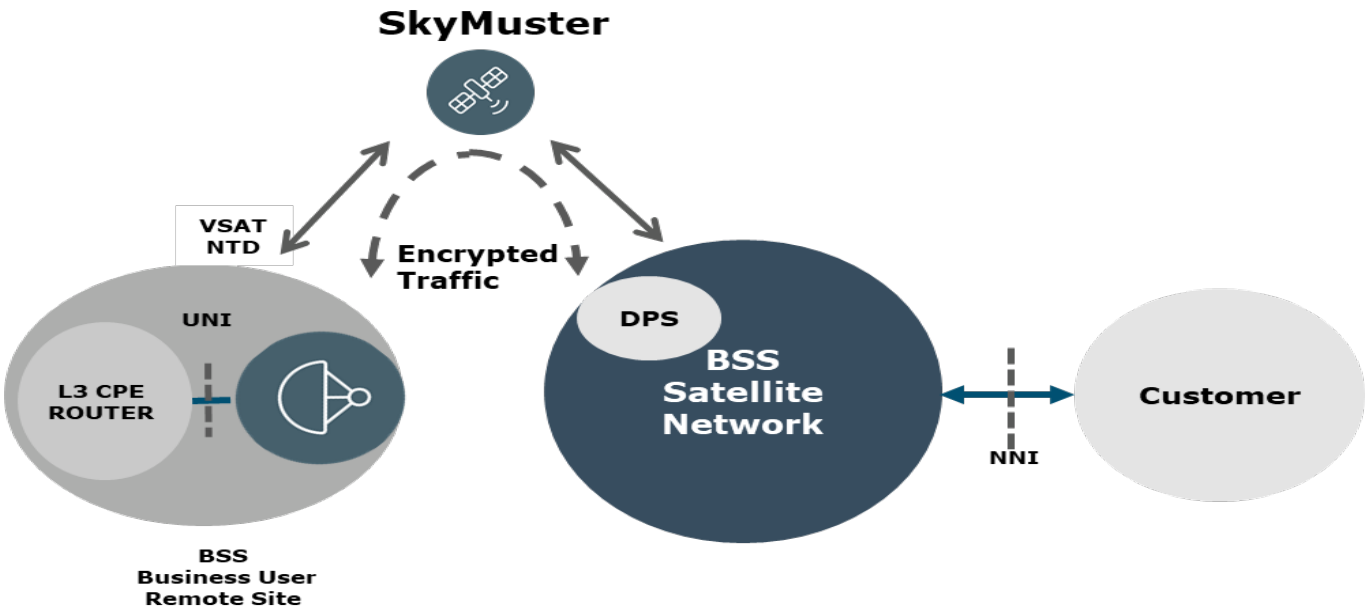

Figure 8 OTA Encryption

8.7 Fleet Plan

nbn® VISP permits RSP to aggregate data usage allowances across multiple **nbn**® VISP Ordered Products where all such Ordered Products have the same provisioned bandwidth profile.

8.8 Performance Enhancing Proxy (PEP)

PEP provides the following two performance enhancement methods.

8.8.1 HTTP Acceleration

In a satellite environment, HTTP performance suffers from latency even when the TCP layer is accelerated (see section 8.8.2). HTTP traffic can be dealt with specifically, to further improve the bandwidth usage and browsing speed.

Internet Page Acceleration (**IPA**) improves the Internet browsing experience while minimizing traffic on the inbound as well as the outbound channels of the satellite network.

Unless PEP is disabled, the following methods are implemented by **nbn** in the BSS Network to achieve HTTP Acceleration:

- **Pre-fetching**: Fetching an HTML page requires a number of TCP connections, one for each embedded object (images, applets, frames, etc.). Sometimes one object must be completely loaded before embedded objects are fetched. For example, an HTML frame set must be completely loaded before the enclosed frames are fetched, which in turn must be completely loaded before the embedded images are fetched.

With **IPA,** the entire page is provided as a single element to the user's browser. As a result, the complete web page is available faster. The IPA pre-fetches the entire web page from the Internet at the first GET request, and then automatically pushes it to the remote VSAT NTD without the need to send additional GET requests for each object. This saves space segment (bandwidth) by eliminating the GET requests on the inbound and reduces the satellite delay. Figure 9 and Figure 10 contrast HTTP traffic with and without pre-fetching.

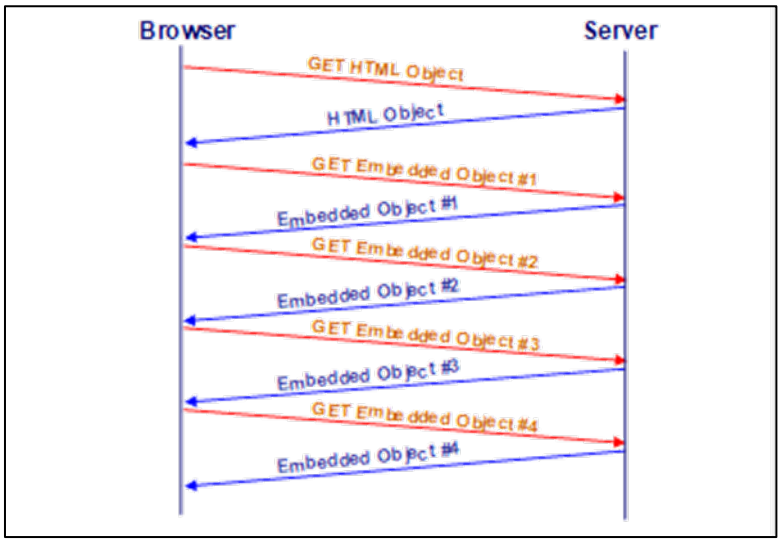

Figure 9: HTTP traffic without pre-fetching

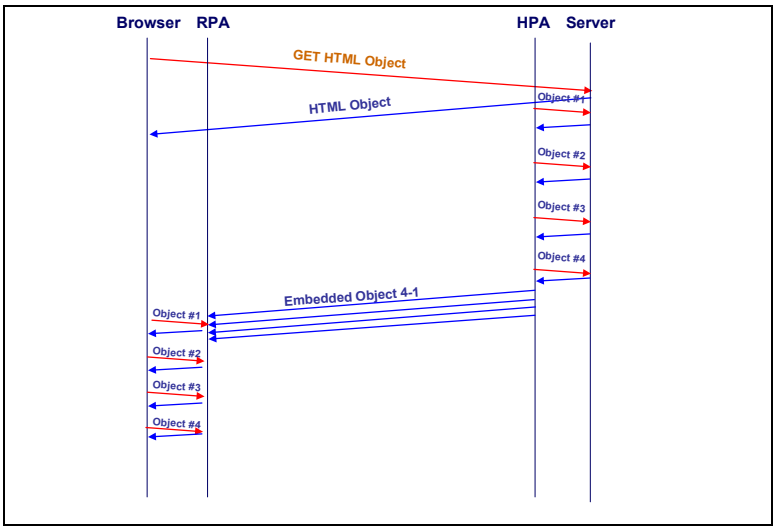

Figure 10: HTTP traffic with pre-fetching

- **Persistent TCP Connections**: Instead of opening a new TCP connection for every HTTP transaction, the Remote Page Accelerator (**RPA**) agent on VSAT NTD opens a single, persistent connection to the Hub Page Accelerator (**HPA**) on the BSS Network after the first object request is received. The End User Equipment and the RPA at the VSAT NTD will establish a standard HTTP dialog, with a new TCP connection for every transaction. These connections are established locally. The RPA will aggregate all the HTTP information into the single TCP link with the HPA and the End User Equipment will then handle it as another TCP connection, using spoofing and encapsulation. This is summarised in Figure 11.

  This implementation saves the latency and protocol overhead involved in the multiple TCP connections required to request a complete web page. This reduction in latency is mostly associated with avoiding the TCP 3-way handshake required for opening and closing connections.

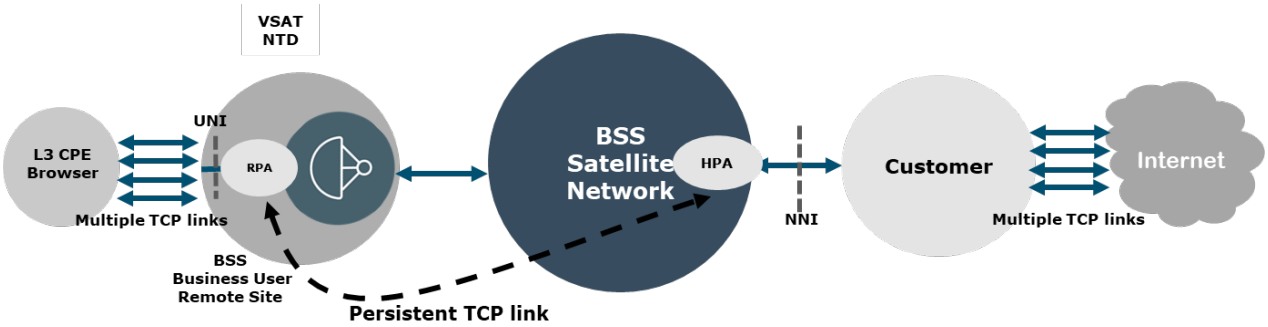

Figure 11: Use of a persistent TCP link (in the context of nbn® ABSL3)

- **Header Compression**: Inbound reduction of bandwidth is performed by the RPA by compressing the HTTP header of inbound packets. This reduces the amount of traffic flowing in the inbound and increases the efficiency of the space segment usage.
- **Text Compression**: The solution supports compression of the outbound text traffic using GZIP. Text compression saves bandwidth since the text portion of a web page (the HTML) accounts for a significant percentage. The HPA compresses text received from the web servers. GZIP can be uncompressed in browsers based on HTTP 1.1.
- **DNS Caching**: DNS caching aims to reduce repeated transactions to DNS servers from different items of End User Equipment connected to the same VSAT NTD and adds to the link efficiency. DNS lookup results are saved for faster retrieval when requested again.

This HTTP Acceleration feature is optional selectable at the time of order. PEP is not supported for any websites or applications that are subject to encryption (e.g. HTTPS).

If this feature is not enabled, web surfing will be much slower.

The effectiveness of HTTP Acceleration depends on various factors (such as web page size, number of objects on the page, cache memory, internet connection speed). Since multiple factors are involved, exact calculation is not feasible. Moreover, HTTP Acceleration will not be able to save the inbound traffic (VSAT NTD to DPS).

8.8.2 TCP Acceleration

Due to propagation delay, the round-trip-time (RTT) between sending and receiving sites in the footprint of the BSS Network is at least 480 milliseconds.

During a connection, the BSS Network employs four congestion control mechanisms to avoid generating an unnecessary amount of network traffic for a certain network condition, as follows:

- slow start;
- congestion avoidance;
- fast retransmit; and
- fast recovery.

These algorithms are used to adjust the amount of unacknowledged data that can be injected into the BSS Network and to retransmit segments dropped by the BSS Network. The effective performance then changes between different operating systems, as the TCP stack is implemented differently.

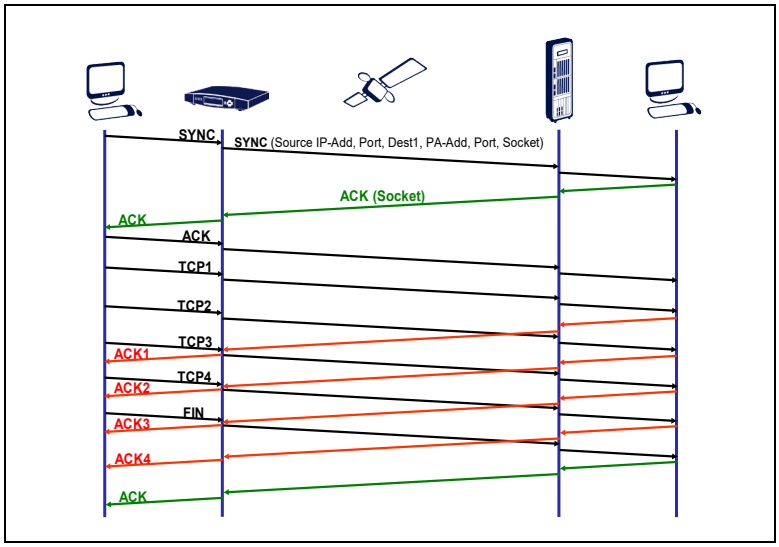

Figure 12: TCP traffic without acceleration

The DPS includes a special mechanism to overcome the limitations described above and boost TCP performance while maintaining the reliability of the transmission. This PEP mechanism is referred to as TCP Acceleration. This protocol is used between the DPS and the VSATs to carry the traffic. The protocol provides reliability and congestion control. The mechanism employed is transparent to the end user and application. There is no need to change any configuration or install any client on the End User Equipment. The mechanism works as follows:

- Selective retransmits and larger windows are used to improve the performance of the TCP sessions;
- TCP data segments are received and locally acknowledged by the VSAT NTD (acting as the remote side of the PEP) on one side and the DPS on the hub side (as recommended in RFC 3135). This speeds up the TCP slow start and allows the sending TCP host to quickly open its congestion window;
- NAKs - local negative acknowledgments are employed on the VSAT NTD to trigger local (and faster) error recovery when significant error rates are detected (such as a spike in noise);
- Retransmission, where the VSAT NTD and DPS locally retransmit data segments lost on the satellite link, thus aiming at faster recovery from lost data. To achieve this, the VSAT and DPS use acknowledgments arriving from the End User Equipment that receives the TCP data segments, along with appropriate timeouts, to determine when to locally retransmit data segments that are lost on the satellite link; and
- Compression of inbound and outbound TCP-IP headers by the VSAT NTD and DPS.

Figure 13 is a schematic of traffic with TCP Acceleration enabled, contrasted with Figure 13 (where TCP Acceleration is disabled).

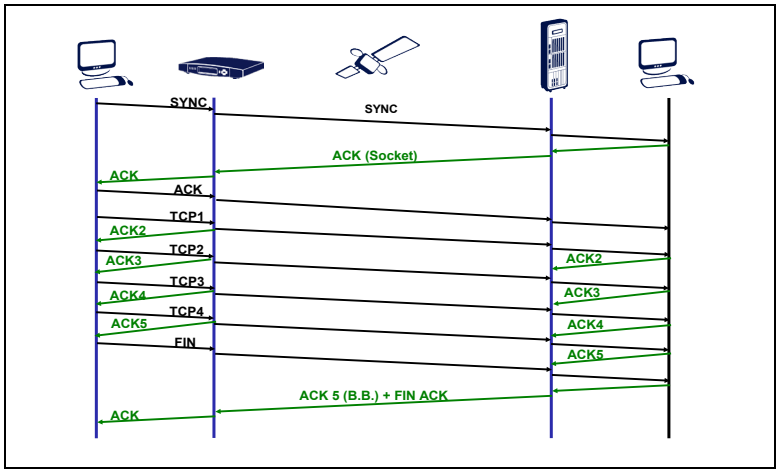

Figure 13: TCP traffic with acceleration

For **nbn**® ABSL3 this feature is enabled by default and can be optionally selectable at the time of placing order.

8.9 Quality of Service (QoS) Marking

RSP may configure each **nbn**® BSS Product to manage BSS Traffic Classes according to QoS Profiles set out in this section 8.9. If none are selected by RSP in the **nbn**® BSS Portal, then the default QoS applied will be QoS Profile Default as per table below.

In respect of each **nbn®** ABSL3 Ordered Product, BSS Traffic Class information provided by the RSP in accordance with the applicable QoS Marking option will be preserved and honoured between the UNI and B-NNI (Forward and Return direction). In respect of each **nbn®** VISP, **nbn®** IoT and **nbn®** Mobility VISP Ordered Product: BSS Traffic Class information in respect of traffic received at the UNI (upstream direction) will only be preserved and honoured in accordance with the applicable QoS Marking option, BSS Traffic Class information in respect of traffic received at the Internet Point of Presence (downstream direction) will not be preserved, and the downstream traffic will be given a Best Effort prioritisation.

RSP may select from the following list of available QoS options. The available QoS Profiles are described in Table 24 QoS Marking options.

QoS Profile Customised allows RSP to define its own QoS profile which may only be defined as part of Solution Design Workshops.

Further details of the QoS Marking options and BSS Traffic Classes are set out at section 2.6 of the **nbn**® BSS ILA Network Interface Specification.

Standard QoS

QoS Options	Queue Type	Traffic Class	CoS Decimal (3bit)	DSCP Decimal (6bit)	CoS / DSCP Names	Max Bit Rate (bps)	Weight	SIP Signalling
QoS Profile: 1	Priority	BSS-TC1	5	40, 46, 48, 56	CS5, EF, CS6, CS7	150 Kbps Fixed		BSS-TC1

QoS Options	Queue Type	Traffic Class	CoS Decimal (3bit)	DSCP Decimal (6bit)	CoS / DSCP Names	Max Bit Rate (bps)	Weight	SIP Signalling
	Best Effort	Default	*	*	Default		Remainder	
QoS Profile: 2	Priority	BSS-TC1	5	40, 46, 48, 56	CS5, EF, CS6, CS7	150 Kbps Fixed		BSS-TC1
	Weighted	BSS-TC2	4 3	32, 34, 36, 38 24, 26, 28, 30	CS4, AF41, AF42, AF43 CS3, AF31, AF32, AF33		90%	
	Best Effort	Default	*	*	Default		Remainder	
QoS Profile: 3	Priority	BSS-TC1	5	40, 46, 48, 56	CS5, EF, CS6, CS7	150 Kbps Fixed		BSS-TC1
	Weighted	BSS-TC2	4 3	32, 34, 36, 38 24, 26, 28, 30	CS4, AF41, AF42, AF43 CS3, AF31, AF32, AF33		60%	
	Weighted	BSS-TC3	2	16, 18, 20, 22	CS2, AF21, AF22, AF23		30%	
	Best Effort	Default	*	*	Default		Remainder	

Customised QoS – RSP Defined

QoS Options	Queue Type	Traffic Class	CoS Decimal (3bit)	DSCP Decimal (6bit)	CoS / DSCP Names	Max Bit Rate (bps)	Weight	SIP Signaling
QoS Profile: Customised	Priority	BSS-TC1	5	40, 46, 48, 56	CS5, EF, CS6, CS7	RSP Defined		
	Weighted	BSS-TC2	4	32, 34, 36, 38	CS4, AF41, AF42, AF43		RSP Defined	
	Weighted	BSS-TC3	3	24, 26, 28, 30	CS3, AF31, AF32, AF33		RSP Defined	
	Weighted	BSS-TC4	2	16, 18, 20, 22	CS2, AF21, AF22, AF23		RSP Defined	BSS-TC4
	Weighted	BSS-TC5	1	8, 10, 12, 14	CS1, AF11, AF12, AF13		RSP Defined	
	Best Effort	BSS-TC6	*	*			RSP Defined	

Table 24 QoS Marking options

Notes:

1. *Refer to section 9.1*
2. *RSP may use QoS Markers to define how much of a particular BSS Traffic Class is handled before other applicable BSS Traffic Classes are given bandwidth.*
3. *Max Bit Rate(bps) means different values can be assigned for upstream and downstream traffic*
4. *Weight means ratio of allocated remaining available capacity after other priority traffic has been carried. Different weighting values can be assigned for upstream and downstream traffic.*

8.10 Time of Day (ToD)

ToD allows an **nbn**® ABSL3 (Uncontended) BVC to have two bandwidth profiles associated with it which may be supplied during specified periods during the 24-hour period of a day. Each period will have a bandwidth profile selected by the RSP. A maximum of two bandwidth profiles may be specified for ToD. Each profile may only apply for one contiguous and different period of time during each day.

Note: The profile change is carried out On-the-fly (**OTF**) on the VSAT. The service impact of the profile change depends on multiple factors, including current configuration, current VSAT load, traffic, and memory buffer usage). Once the change has been initiated, there may be a service interruption of several seconds.

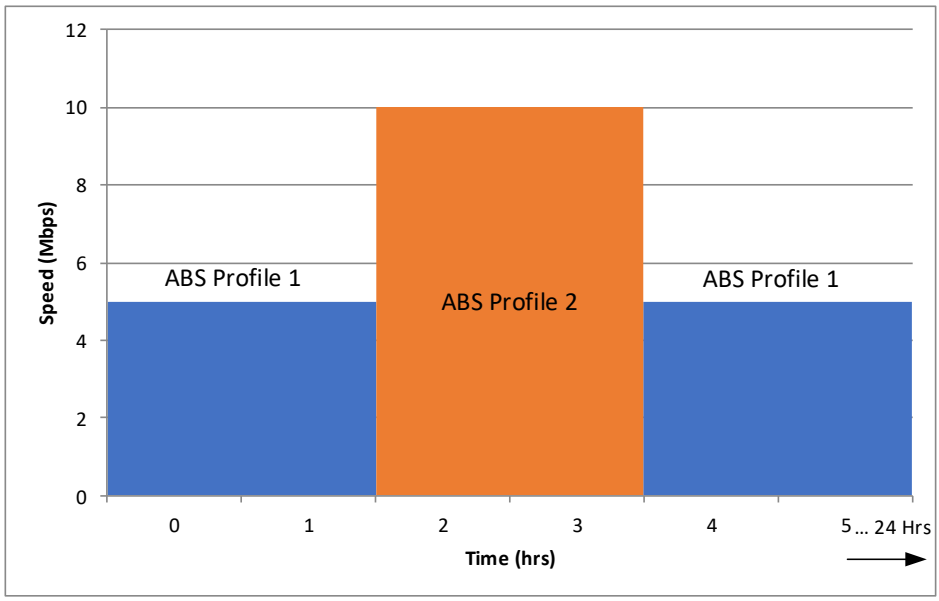

Figure 14 Example ToD bandwidth profiles

8.11 VoIP Prioritisation

VoIP (Voice over IP) Prioritisation identifies VoIP traffic by detecting SIP or NIS list of codecs. **nbn** will allocate a dedicated VoIP channel over the air dynamically, based on the signalling message (SIP) or identified codec (RTP).

The following RTP codecs are supported:

- G.723 @ 30ms. FWD 6Kbps / RTN 8.6Kbps
- G.729 @ 20ms. FWD 8Kbps / RTN 9.6Kbps
- G.711 @ 20ms. FWD 70Kbps / RTN 76.8Kbps

This dedicated channel has the highest priority against all other defined traffic types (including priority BSS Traffic Classes under a QoS Marking profile) regardless of the original packet. This prioritisation is applied only over the air. The VoIP traffic is not prioritised when it traverses the link between the DPS and the B-NNI.

The dedicated channel for VoIP traffic will be allocated from the relevant provisioned BVC or IAC bandwidth (Forward and Return). If the total bandwidth of VoIP channels exceeds provisioned bandwidth in any direction, the traffic will be dropped as per normal burst policy. RSP is responsible for ensuring that CIR capacity selected is sufficient to handle all ordered VoIP services using the codec which they selected. The maximum number of concurrent VoIP channels is defined in the **nbn**® BSS ILA Network Interface Specification. Upon reaching the maximum number of concurrent selected VoIP channels, VoIP Prioritisation will not apply to any new VoIP stream. This is summarised in Figure 15.

If the VoIP traffic is encapsulated or encrypted by the End User in any way or any unsupported RTP codec is used, VoIP Prioritisation will not apply in relation to that VoIP traffic and the traffic will be carried according to the applicable BSS Traffic Class.

The supported RTP codecs are set out in the **nbn**® BSS ILA Network Interface Specification.

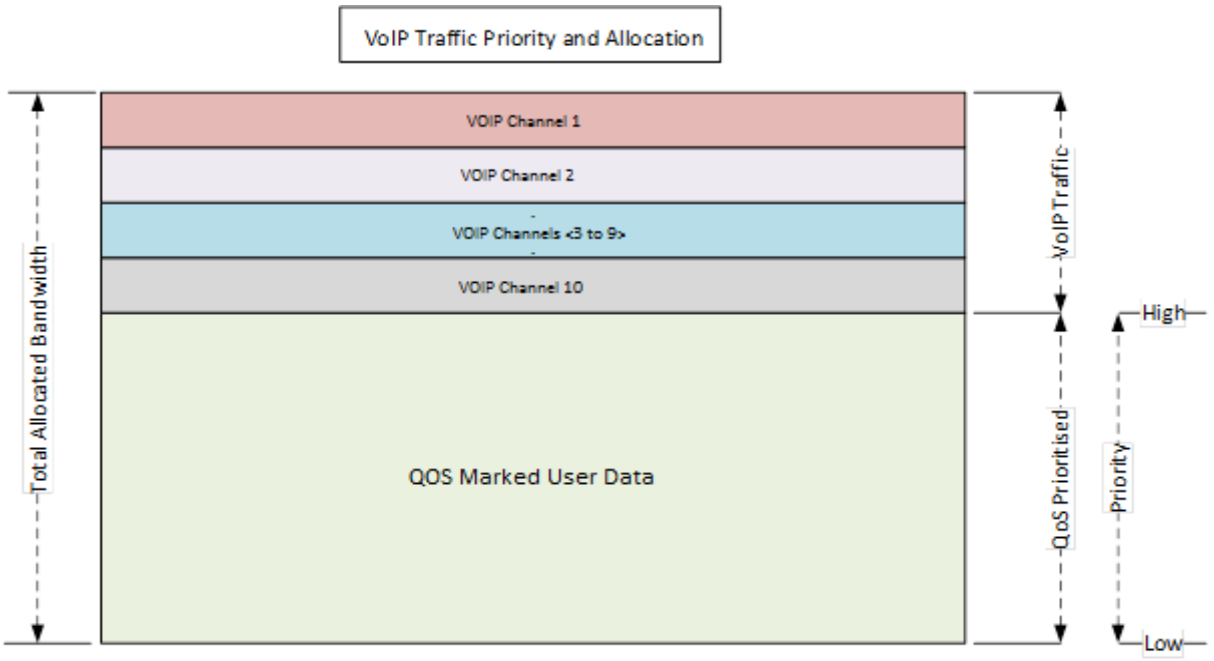

Figure 15 VoIP Traffic Priority and Allocation per Ordered Product

8.12 Port Forwarding

Port Forwarding is a feature that is available in respect of Ordered Products that are supplied using NAT mode of UNI-D IP address allocation. Port Forwarding is not available in respect of Ordered Products that are supplied using Route mode of UNI-D IP address allocation.

Port Forwarding is supported in IPv4 addressing mode (IPv6 is not supported).

The traffic being sent to the IDU is not filtered. Port Forwarding can ensure mapping of incoming traffic using a particular port to a specific internal IP and port on the Premises-side of the **nbn**® Downstream Network Boundary. All other incoming traffic will be disregarded.

Port Forwarding includes the following attributes:

- VLAN: VLAN(s) selected by RSP.
- Protocol: defaults to TCP.
- External port: the port number for the incoming traffic that requires redirection.
- Internal port: the port number the traffic needs to be directed to.
- Internal host: the internal IP address the traffic needs to be directed to.

Port Forwarding includes the following limitations:

- A maximum of 10 port mapping entries is supported per Ordered Product.
- Supports TCP and UDP protocols (other protocols are not supported).
- The external port can be mapped to either TCP or UDP protocol for each line item (as per the example in the table below).
- The combination of internal port and internal host must be unique.
- External port:
    - Must be a single integer from 0 to 65535 (port number).
    - Port number 161 is a restricted port number in the BSS Network and cannot be used for the purpose of Port Forwarding by the VSAT NTD.
    - For each line item, the port number for the external port must not be a range (as per the example in the table below).
- Internal port:

- Must be a single integer from 0 to 65535 (port number).
- For each line item, the port number for the internal port must not be a range (as per the example in the table below).

- Internal host:
  - Internal host must fall within the subnet defined by the LAN private IPv4 address for the UNI VLAN.
  - Internal host cannot be the subnet's network address, first usable address or broadcast address (eg if the LAN private IPv4 is 192.168.99.0/24, then 192.168.99.0, 192.168.99.255 and 192.168.99.1 cannot be used).

For example, if a network on the public IP side of the IDU had a WAN IPv4 address of 103.73.137.7 and the Port Forwarding was configured as:

External host	External port	Internal host	Internal port
103.73.137.7	200	192.168.200.10	8080
103.73.137.7	201	192.168.200.10	80
103.73.137.7	202	192.168.200.10	443

The mapping above would result in a request to traverse traffic only through source IP/port 103.73.137.7:200, 103.73.137.7:201 or 103.73.137.7:202 and the traffic would be redirected to the internal network through destination IP/port 192.168.200.10:8080, 192.168.200.10:80 or 192.168.200.10:443 in correspondence. All other packets would be dropped.

8.13 GTP Acceleration

GTP Acceleration is a feature used to accelerate backhaul (CBH) traffic (e.g., from a cellular network) within a GTP (GPRS Tunnelling Protocol) tunnel if RSP carries End User's data traffic in other networks. GTP Acceleration provides:

- TCP Acceleration;
- Header Compression (similar to normal PEP); and
- separation of real-time traffic from non-real-time traffic,

as long as the encapsulated traffic is carried between a given pair of GTP tunnel endpoints.

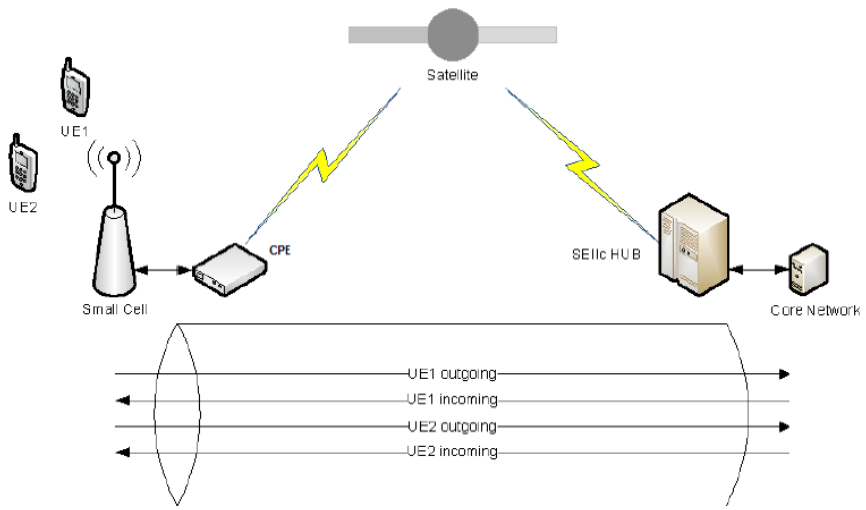

Figure 16 Generic GTP tunnel

A GTP tunnel has the following characteristics:

- Source IP (external).
- Destination IP (external).
- Tunnel endpoint ID (TEID).
- VLAN (or VR).

The GTP tunnel performs:

- For TCP traffic: Header Compression and TCP Acceleration.
- For UDP traffic: no Header Compression.
- For VoIP traffic: supports C2P-based VoIP.

GTP tunnel limitations:

- The VSAT NTD supports up to 128 GTP tunnels per direction (Return link or Forward link).

8.14 Generic Routing Encapsulation (GRE) Acceleration

GRE acceleration technique provides the ability to enhance End User application experience by accelerating TCP and HTTP traffic that exists within a GRE tunnel presented by RSP. GRE acceleration supports IP over GRE for **nbn**® ABSL3, **nbn**® Mobility Private Network Layer 3 and **nbn**® VISP services.

The GRE acceleration implementation in the BSS Network supports two main standards:

- RFC2890 - Key and Sequence Number Extensions to GRE
- RFC2784 - Generic Routing Encapsulation (GRE)

The protocol ID for Layer 3 is (0x0800). Other Protocol ID types will be carried through the BSS Network like any other datagram protocol without acceleration applied.

The BSS Network supports GRE with TCP traffic and will allow TCP acceleration to optimise traffic including encrypted application traffic which uses TCP protocol.

TCP acceleration will not work when the TCP header is encrypted, therefore GRE acceleration will not be able to enable optimisation of this traffic.

9 Service Performance

9.1 QoS Class Performance

nbn will aim to achieve the standards (on an individual BSS Traffic Class basis) for each BSS Traffic Class set out in the below table.

BSS Traffic Class	Frame Delay Variation	Frame Delay	Frame Loss
BSS Traffic Class 1	<25msec	<370msec	0.04%
BSS Traffic Class 2	<25msec	<370msec	0.04%
BSS Traffic Class 3	<25msec	<370msec	0.04%
BSS Traffic Class 4	<25msec	<370msec	0.04%
BSS Traffic Class 5	<25msec	<370msec	0.04%
BSS Traffic Class 6	Not applicable	Not applicable	Not applicable

Table 25 BSS Traffic Class specifications and commitments

Note:

- *Performance targets refer only to CIR services and are averages over a period of 48 hours.*
- *Frame Delay calculation factors include satellite delay, processing delay, frame delay variation and fibre link delays.*
- *Frame Loss assumes the signal-to-noise ratio is above the desired minimum threshold value per link-budget and no loss on fibre link.*
- *QoS Markers are ordered and activated within QoS Profiles.*

10 BSS Class of Service (CoS)

10.1 BSS CoS Architecture

The BSS Network supports the carriage of a range of BSS Traffic Classes to accommodate a variety of higher layer applications. RSP may take advantage of these higher layer applications to provide more tailored performance and effective utilisation of the BSS Network.

The BSS Traffic Class of traffic is included in the header information and are set by the RSP in relation to the traffic presented to the BSS Network. The QoS Markers selected by the RSP will define how each BSS Traffic Class is managed within the BSS Network. If the RSP does not select any optional QoS Markers, **nbn** will manage each BSS Traffic Class presented in the RSP traffic in line with the Default QoS Marker.

10.1.1 Bandwidth Profiles Parameter Considerations

This section describes the bandwidth profile parameters used within the BSS Network.

10.1.1.1 Calculation of Information Rate

All Information Rate limitations, including as set out in this **nbn**® BSS ILA Product Technical Specification, are enforced at both the UNI-D and, where applicable, at the **nbn**® Upstream Network Boundary between the RSP and the BSS Network.

For clarity, the Information Rate calculation definition is based only upon Layer 2. The effective Layer 2 payload rate of the BSS 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 **nbn**® BSS ILA Network Interface Specification. It is the responsibility of RSP to accommodate any payload rate degradation as a result of Layer 2 Frame Sizes.

10.1.1.2 Committed Information Rate

Committed Information Rate (**CIR**) traffic will be carried through the BSS Network in the Forward and Return direction (RF Gateway to the VSAT NTD/ VSAT NTD to the RF Gateway) under normal conditions within performance targets specified in this **nbn®** BSS ILA Product Technical Specification.

10.1.1.3 Peak Information Rate

Peak Information Rate (**PIR**) is the maximum information rate at which the BSS Network is committed to transfer for a particular link under normal conditions. Traffic capacity in excess of the CIR and within the PIR will be carried through the BSS Network without any performance objectives. Traffic that exceeds the PIR will be discarded at ingress to the BSS Network. PIR is subject to the limitations described in sections 4.4, 5.2, 6.2 and 9 of this **nbn®** BSS ILA Product Technical Specification and section 27 of the **nbn**® BSS ILA Product Description.

10.1.1.4 Network Burst

Network Burst is the capability to transmit traffic higher than the configured bandwidth profile without dropping any packets. Supported Network Burst sizes are set out in the **nbn**® BSS ILA Network Interface Specification.

Schedule A – VSAT Mounting Equipment

The following table summarises the currently available VSAT Mounting Equipment orderable by RSP.

Model Number	Mount Type	Height to centre of antenna mm	Wall Connection	VSAT	Twist Bar mm	Pole dia. Mounting Point mm	Pole Base mm
25226	Pole (Braced) Mount	2800 - 3800	2 @ 600-800mm from centre of antenna	0.74m	300	60.3	60.3
25324	Pole (Braced) Mount	2800 - 3800	2 @ 600-800mm from centre of antenna	1.20m	300	88.9	88.9
25222	Extended Pole (Braced) Mount	3800 - 5000	2 @ 600-800mm from centre of antenna	0.74m	300	60.3	60.3
25326	Extended Pole (Braced) Mount	3800 - 5000	2 @ 600-800mm from centre of antenna	1.20m	300	88.9	88.9
25239	Wall Mount	Height mounted on wall	3	0.74m	N/A	N/A	N/A
25328	Wall Mount	Height mounted on wall	3	1.20m	N/A	N/A	N/A
25235	Ground Cantilever Mount	Max 900	None	0.74m	300	60.3	60.3
25331	Ground Cantilever Mount	Max 1160	None	1.20m	300	88.9	88.9
25333	Ground Cantilever Mount	Max 1500	None	1.80m	400	139.7	139.7
25214	Extended Ground Cantilever Mount	Max 2750	None	0.74m	400	60.3	165.1
25217	Extended Ground Cantilever Mount	Max 2750	None	1.20m	400	76.1	165.1
25335	Extended Ground Cantilever Mount	Max 1900	None	1.80m	400	88.9	165.1
25196	Roof Mount	Max 900	Roof x 3	0.74m	N/A	60.3	N/A
25206	Roof Mount	Max 1160	Roof x 3	1.20m	N/A	76.1	N/A
Z25237	Gutter Mount	Max 900	Rafters x 2	0.74m	N/A	60.3	N/A
Z25238	Gutter Mount	Max 1160	Rafters x 2	1.20m	N/A	88.9	N/A
	0.74m Non-Penetrating	Height of mounting	None	0.74m	N/A	N/A	N/A

Model Number	Mount Type	Height to centre of antenna mm	Wall Connection	VSAT	Twist Bar mm	Pole dia. Mounting Point mm	Pole Base mm
	Mount 2.37” OD						
	1.20m Non-Penetrating Mount 2.88" OD	Height of mounting	None	1.20m	N/A	N/A	N/A
	1.80m Non-Penetrating Mount 5.56" OD	Height of mounting	None	1.80m	N/A	N/A	N/A