



Wholesale NBN Co Wireless Access Service

Product Overview

Wireless Access Services

August 2010





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Environment

NBN Co asks that you consider the environment before printing this document

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1 Introduction

NBN Co Wireless Access Service (NWAS) is a wholesale, ‘Emulated Layer 2’ Ethernet Access product suite that utilises 4th generation wireless access technology to deliver high-speed broadband connectivity for Australian homes and businesses.

NWAS provides Access Seekers with an Ethernet access solution from the NBN Co Point of Interconnect (POI) to the End User interfaces on the Network Terminating Unit (NTU) located at the end-user premises.

The purpose of releasing this Wireless Product Overview is to obtain direct feedback from the industry on the proposed design of the Wireless Access Products.

This document provides Access Seekers with an overview of NWAS products, including:

- key features
- product components and attributes
- major network connection elements (including Access Seeker interconnection arrangements) and
- product pricing structures.

NBN Co’s objective is to be open and transparent in its dealings with the industry and interested stakeholders. We are keen to provide our stakeholders with the opportunity to directly provide their views on key issues related to the Wireless Access Products. Accordingly, this Wireless Product Overview is intended to serve as the starting point for a discussion with our stakeholders.

We welcome written submissions from interested parties on this Product Overview, and will be consulting directly with interested parties where appropriate. Interested parties have until 2 September 2010 to provide written submissions. Submissions can be sent via email to: feedback@nbnco.com.au.

All submissions will be published on NBN Co’s website. Therefore, NBN Co would like submitters to provide a document suitable for publication. If submitters have confidential information they wish to provide, NBN Co asks that these sections are highlighted and that a public version of the submission is also provided.

As part of the overall development of our commercial products, and the further definition of the network architecture, NBN Co is also developing a related POI Consultation Paper and a Pricing Paper.

Planned consultation and information release activities are detailed at Annex A1.

Other documents to be published over coming months include:

- NWAS Product Technical Specification
- Service Management and Operations Manual

- Deployment Guide
- Systems Manual

In a number of places in this paper, NBN Co has provided details of the speeds at which the NBN or a particular wholesale product offering is capable of operating. However, it is important for acquirers of NWAS to recognise that the speeds actually achieved by an End-User will depend on a number of factors, including the terms of the retail broadband plan, the End-User's chosen hardware and their in-premises connection.

A glossary of acronyms and abbreviations is included in the Glossary of Terms Section in Annex A2.

1.1 Benefits

The NWAS product offering will provide wholesale high-speed broadband wireless access services to Access Seekers, to enable both mass market and business focused services with the following industry and End User characteristics:

1.1.1 High Speed and High Quality Broadband Access

NWAS is designed to provide speeds of 12 Mbps downstream and 1 Mbps upstream to mass market customers and 4 Mbps upstream for business customers at launch. NWAS Product features draw on the capabilities of the latest wireless technology to deliver maximum performance and a consistent and predictable service experience¹.

1.1.2 Flexibility

The product structure has been designed with a wholesale component approach as utilised in the FTTP and satellite platforms. This provides a high level of flexibility and utility to Access Seekers by minimising the requirement to adjust retail services between FTTP, wireless and satellite delivery mechanisms. Simple, standard service offerings from NBN Co will enable Access Seekers to more easily tailor and add features to differentiate their retail offerings in the market.

1.1.3 High Quality Service Management

Access Seekers using NWAS will be supported by automated systems for service ordering and provisioning, service assurance and reporting/billing. Online service reporting and management tools will assist Access Seekers to carry out service management and through extension of a sub-set of these features, as part of a retail product, will enhance communication with End Users on service availability and fault restoration during the service lifecycle. Service management systems will be standardised as much as possible across the access technologies to facilitate consistent service offerings to end users.

1.1.4 Wireless Access Footprint

NWAS will deliver broadband access to a further 4% of premises located beyond the 93% coverage provided by FTTP i.e. within the 93% to 97% band. Access Seekers connect to a wireless access serving area through the associated Point of Interconnect (POI). NWAS access speed is designed to deliver speeds of 12Mbps downstream 4 Mbps for Business Services and 1 Mbps upstream to consumer End Users across the wireless footprint.

1.1.5 Service Migration

NWAS services and support systems are designed to enable a predictable service migration process from existing copper-based or other access-based services.

¹ It is important however, for acquirers of the NWAS to recognise that the speeds actually achieved by an End User will depend on a number of factors, including the terms of the retail broadband plan, the End User's chosen hardware and their in-premises connection.

1.1.6 Rollout

An indicative wireless rollout schedule will be published and updated from time to time to provide End Users and Access Seekers with as much visibility as possible of the local rollout. This is intended to assist Access Seekers to plan acquisition campaigns and maximise uptake.

1.2 Key Product Features

Following is an outline of the key features to be delivered in the initial release of the NNAS product set.

1.2.1 End User Premises

- Fixed Wireless NTUs with multiple End User facing Ethernet ports (User Network Interfaces – UNI)
- Professional installation of outdoor fixed antenna for maximum signal strength and predictability of performance
- NTUs that enable Access Seekers to offer multiple End User services such as voice, broadband and IPTV simultaneously
- NTUs that guarantee multiple Access Seekers the ability to provide services to a single End User
- Wireless access services with speeds of 12 Mbps downstream and 1 Mbps upstream suitable for consumer and small business End Users at launch of the service
-
- Provision of optional IP Multicast capability to enable Access Seekers to deliver IPTV or other 'media' to a group of destinations or End Users, simultaneously.

1.2.2 Within the NBN Co Network

- Additional upstream speeds and differentiated premium service levels to facilitate up-sell opportunities for Access Seekers
- The ability for an Access Seeker to assemble product components (Interfaces, access and connectivity virtual circuits) to support their own unique business and deployment model
- A network that allows Access Seekers to control/manage points of contention

- A Class of Service (COS) model that enables Access Seekers to map existing end to end Quality of Service (QoS) strategies across the NAWAS product set
- A range of additional services and features such as VLAN tagging and IP Multicast delivery
- Enhanced service monitoring including operations and maintenance (OAM) to support flexible Access Seeker service levels

1.2.3 At the Access Seeker Point of Interconnect

- A range of physical interfaces and aggregate speed options at the Network to Network Interface (NNI) to cater for Access Seekers with varying levels of network infrastructure and End User scale
- Protection options to enable Access Seekers to deliver a high grade of service and to differentiate their offerings

1.2.4 Exclusions

The NAWAS product suite does not include the provision of:

- Facility based infrastructure (co-location, hosting data centre) at the POI
- Backhaul transmission infrastructure from the POI to the Access Seeker Point of Presence (PoP)
- Content or applications including IP Transit, Internet Gateway Connection, BNG capability or Soft Switching infrastructure
- Tower Site Sharing, co-location of third party equipment at radio base station sites

2 Wireless Product Overview

Product Suite

The NNAS product suite consists of a number of components which are used by Access Seekers as “building blocks” to provide an end-to-end service. NNAS represents the “access network” portion of the overall network chain and is used as a conduit for delivering the Access Seeker’s applications and services, as illustrated in the ISP application environment, Figure 2.1.

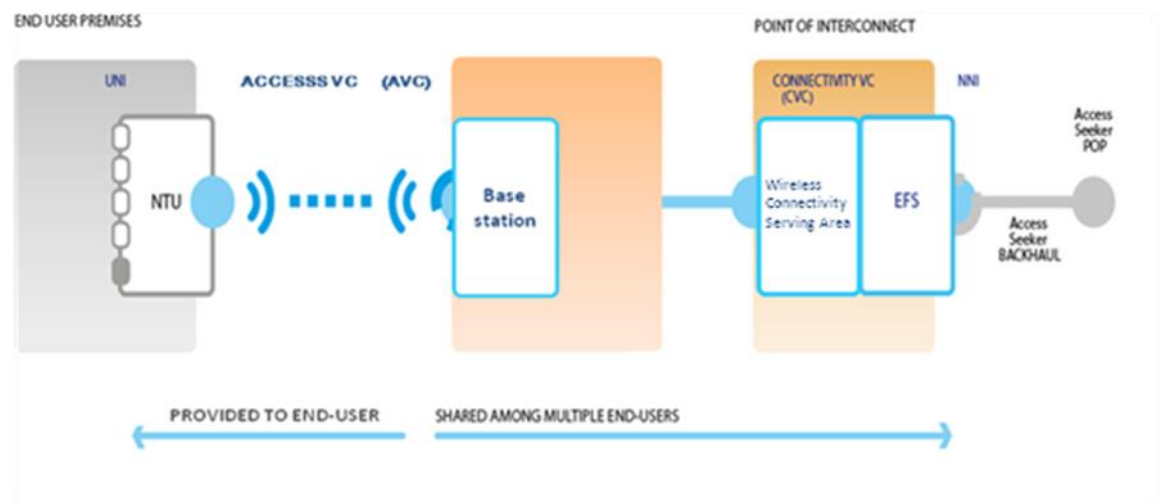
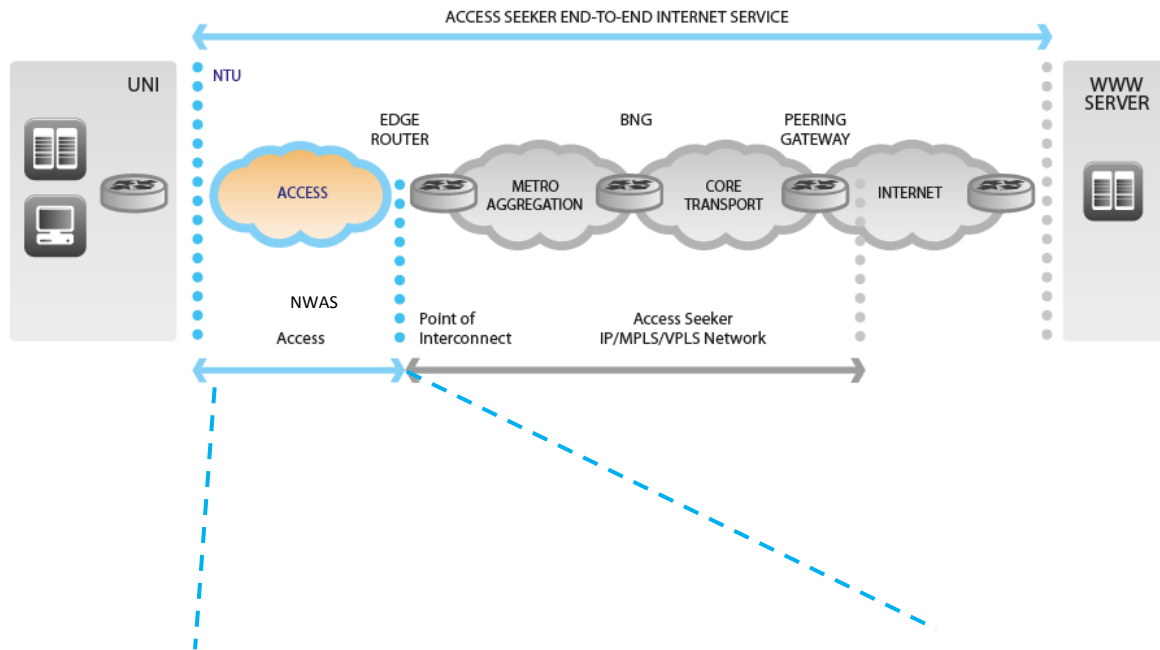


FIGURE 2.1 - HIGH-LEVEL NNAS ACCESS SERVICES USED FOR INTERNET CONNECTIVITY

NNAS delivers an active wholesale network connection via one or more Ethernet Virtual Circuits (EVCs) from the NBN Co POI to the End User premises. It delivers the EVCs via Ethernet interfaces at the End User’s Premises. Access Seekers can interconnect at designated NBN Co POIs which serve

defined geographical Wireless Serving Areas (WSA). NWAS POI locations and NNI interconnections are used for accessing NWAS services.

The initial product in the NWAS product suite comprises:

- Ethernet Bitstream Service including
 - A Multicast service option
 - Enhanced features for business

NWAS products are described in the following sections. To the extent possible, there is consistency between NWAS and the NBN Co Fibre Access Services to reduce complexity for the Access Seeker in servicing wireless end users.

Certain features may be specific to a product. Options will be detailed in a Product Description during the solution definition phase.

2.1 Key Wireless Wholesale Product Components

The NFAS product consists of four key product components – two physical and two logical network bandwidth elements. These four components also exist in the delivery of an NWAS service and are illustrated in Figure 2.2 below:

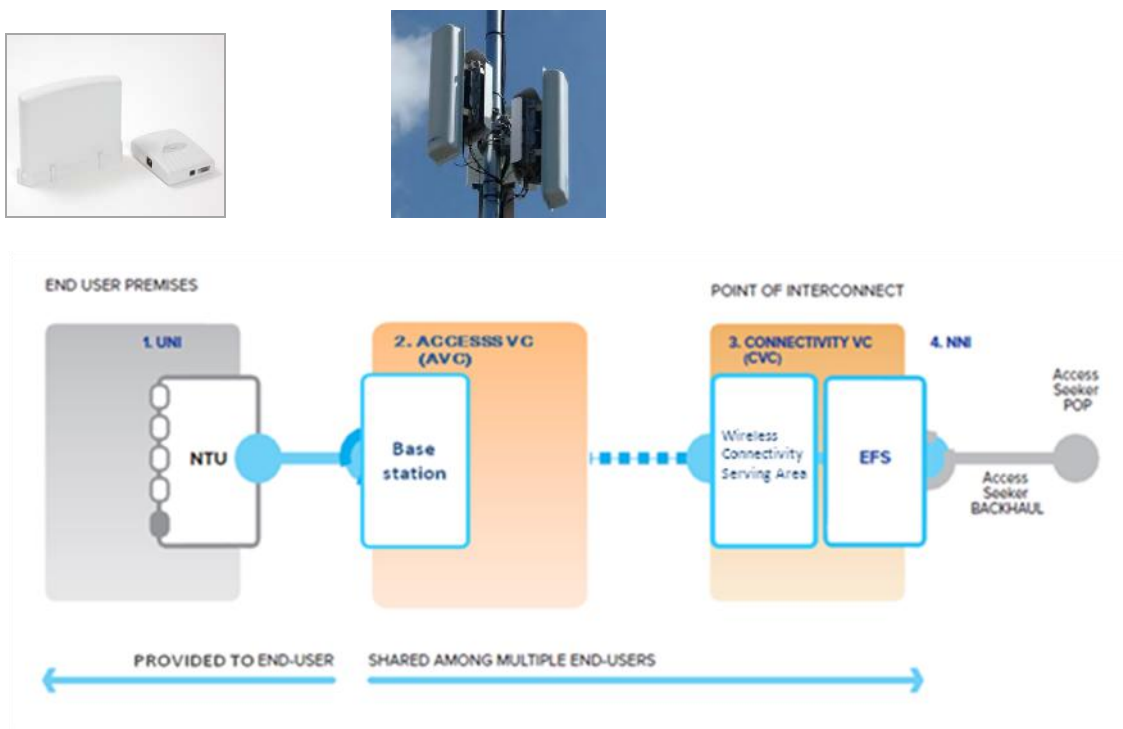


FIGURE 2.2 - LOGICAL NWAS NETWORK DELIVERY COMPONENTS

UNI – User Network Interface

NNI – Network to Network Interface

NTU – Network Terminating Unit

EFS – Ethernet Fanout Switch (POI Termination)

POI – Point of Interconnect

GW – Gateway

For description of the four components (UNI, AVC, CVC, NNI), refer to the Product Overview Fibre Access Services .

The following variations apply specifically to the NNAS product suite:

- **UNI** – Ethernet Data Interface UNI-D. No support for UNI-DSL or UNI-V
- **AVC** – The Access VC speed is specified as having a Peak Information Rate (PIR)
- **CVC** – A minimum of one CVC is required per Access Seeker per Packet Gateway in order to aggregate the associated access services.

Component	Applies To	Notes
1. User Network Interface (UNI)	End User	The UNI provides physical handoff of Access VCs at an End User premises. One (or more) UNI can be ordered by an Access Seeker. An Access Seeker can map one or more Access VCs to one UNI.
2. Access VC (AVC)	End User	Access Seekers should order one or more Access VCs for each end-user that is to be served. AVCs can be ordered as Unicast or Multicast, and be delivered to one or a number or multiple UNIs.
3. Connectivity VC (CVC)	Wireless Connectivity Serving Area	A Connectivity VC (CVC) aggregates multiple Access VCs at a Wireless Connectivity Serving Area. The CVC is shared among nominated AVCs and allows the Access Seeker to manage network contention.
4. Network-Network Interface (NNI)	POI	The NNI provides physical aggregation of several Connectivity VCs across a Wireless Packet Gateway. It forms the physical handoff point to the Access Seeker at a POI and may be configured with redundant interface protection options.

TABLE 2.1 - NNAS PRODUCT COMPONENTS SUMMARY

3 NNAS Wholesale Product

NWAS will provide the following product services and capabilities:

- Ethernet Bitstream Service
- Interconnection Arrangements
- Class of Service (CoS)
- Multicast (MC) Capability
- Service OAM and Reporting

3.1 Ethernet Bitstream Services (EBS)

The EBS provides Access Seekers with a Layer 2 access service between the UNI on the NTU at an End User Premises and the NNI located at the POI. Note that while the access will be layer 2, certain access link features may require layer 3 operation, for example, Multicast.

The logical architecture of the EBS construct, including Access and Connectivity Virtual Circuits, is depicted in Figure 3.1 and shows the boundary within the End-User Premises that is known as the Wholesale Services 'UNI' Boundary, as well as the Access Seeker's POI NNI network boundary.

NWAS EBS product can be purchased with single/multiple AVCs to a single/multiple UNI-D. AVC speeds at launch are speeds of 12 Mbps downstream and 4 Mbps upstream.

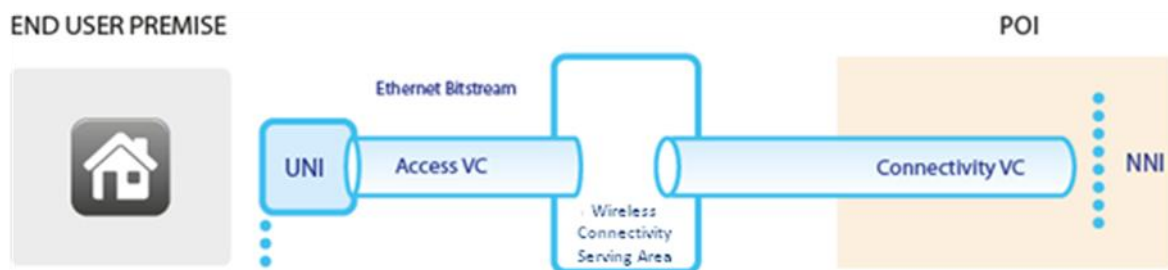


FIGURE 3.1 – NWAS EBS STRUCTURE

NWAS EBS is designed for mass market broadband services and includes the following features:

- Internal NTU with external wireless antenna unit
- 4 x Ethernet ports at User Network Interface (UNI)
- Access speeds of 12 Mbps downstream (PIR) and 1, 2 or 4 Mbps upstream
- Connection and aggregation of multiple Access VCs via the Connectivity VC Access Seeker interconnection via the Ethernet Interface at the Network to Network Interface (NNI)

3.2 Ethernet Bitstream Service Features for Business

It is recognised that NNAS will also be used by Access Seekers to provide higher quality services to business premises. As such NNAS provides a number of enhanced features to facilitate this.

The EBS product supports the following features at launch:

- AVC protection options
- An enhanced range of service provisioning and restoration options
- Enhanced reporting

It may also support features that enable VPN and Thin Client implementations.

The NNAS EBS service will manage VLAN tagging and VLAN pass-through in accordance with the NFAS product. Refer to the Product Overview Fibre Access Services.

3.3 Class of Service (COS) and QoS

The NNAS product suite will support COS management and QoS mapping in accordance with the NFAS product (subject to vendor support). Refer to the Product Overview Fibre Access Services.

3.4 Battery Back-Up

The NTU will be able to accommodate an optional and backup battery in its regulated power source. NBN Co will not however, supply, install or maintain the backup battery. Rather, it is envisaged that the ongoing supply and management of batteries will be handled by the Access Seekers. NBN Co will offer a remote monitoring service to Access Seekers which will enable an Access Seeker to identify when power is not being supplied to a particular NTU. It will be up to Access Seekers whether they choose to acquire the remote monitoring service. However, NBN Co recommends that Access Seekers notify end-users of the availability of this service.

3.5 Multicast

Multicast may be used for delivery of IPTV consumer content or private business TV services such as digital advertising, executive presentations to staff or training sessions. (see Product Overview Fibre Access Services)

NNAS services support the option for limited IP multicast delivery using “trickle down” content delivery. That is, Multicast data will be sent to the end users on the Multicast AVC, allowing for a single stream to be presented to all target end users across the mainland. In this scenario, content will be downloaded at low-speed (typically 512kbps) and stored in the CPE set-top unit for later playback.

It is envisaged that a wireless end user configured to participate in multicast sessions will be managed by the Access Seeker in the same way as an NFAS end user.

3.6 NWAS Operations, Administration and Maintenance (OAM)

NWAS services will integrate with and be visible from the Access Seeker OAM provisioned for NFAS services. Refer to the Product Overview Fibre Access Services. It will, where possible support specific vendor and Access Seeker systems features unique to the Wireless platform operating environment. NWAS OAM is available as a standard option or as an enhanced option which provides more comprehensive network management capabilities.

3.6.1 Reporting

NWAS services will provide reporting consistent with NFAS product suite. Refer to the Product Overview Fibre Access Services.

3.6.2 Installation & Assurance

NBN Co. will engage third party contractors to install and maintain its equipment at end-user premises. This provides access to human resources with tools and training specific to the NWAS products that can be monitored for service level performance.

NBN Co. contractors may extend their activity to include “discretionary” services such as adapting or installing new house wiring, establishing Access Seeker residential gateway operation, undertaking maintenance on NBN Co. equipment damaged by the end user. Those services may be made available to an Access Seeker on a Fee-for-Service basis. However, it would always be open to an Access Seeker, or end-user to acquire those services from another supplier.

3.7 Service Availability

The NWAS product suite includes a high level of network resilience to provide a reliable performance for end-users.

Further redundancy may be purchased in addition to the base NWAS products. The options include:

- Duplicate end user equipment and AVC
- Protected NNI (as per NFAS product)

4 Wholesale Product Catalogue

NBN Co’s Product Catalogue is aligned to the key product components outlined in Section 2 and defines key elements for pricing and value proposition development. It enables NWAS products to be built at a component level to provide a high level of flexibility to Access Seekers.

The Product Catalogue defines orderable elements of the product and related attributes. It represents some but not all pricing elements.

Refer to NWAS pricing Guide for more complete details on pricing, pricing elements and the NWAS Technical Specification for a detailed description of the configuration attributes.

4.1 Catalogue Structure

The following catalogue shows the charge structure and feature elements available for ordering on an NWS services.

4.1.1 UNI Selectable Options and Descriptions:

User Network Interface (UNI)		
Option	Description	Comments
UNI-D	10/100/1000 Base T	Std Ethernet Interface
Back-up power	Battery back-up power capability excluding battery	

TABLE 4.1 – UNI OPTIONS

4.1.2 Access Virtual Circuit Chargeable Options

Access Virtual Circuits				
Options	Downstream	Upstream	Monthly Charge	Comments
Speed combination inclusive of UNI-D	12 Mbps	1 Mbps	tba	
	12 Mbps	2 Mbps	tba	
	12 Mbps	4 Mbps	tba	

TABLE 4.2 – AVC OPTIONS

Additional selectable features and options (pricing not included)		
Transparency	CE-VLAN transparency	Under evaluation for business users
	Control Protocol transparency	
Service OAM	Monitor service in real time and diagnostic capability	
Multicast Capability	Optional feature to support IP TV broadcast	
	IPv4	Multicast Version
	IPv6	
Modifications	Changes of speed or feature	

TABLE 4.3 – ADDITIONAL AVC OPTIONS

4.1.3 Connectivity VC Orderable Options and Descriptions

The Connectivity VC is dimensioned by the Access Seeker according to aggregated capacity requirements and forecast growth. The smallest capacity increment starts at 10Mbps CIR.

Bandwidth Options (Mbps)	Monthly Charge
10	tba
20	tba
50	tba
100	tba
150	tba
200	tba
300	tba
400	tba
500	tba
750	tba
1000	tba
Additional Options	Description
Multicast Domain	N:1 multicast based on CVC bandwidth option
Modifications	changes of speed or feature

TABLE 4.4 – CVC BANDWIDTH OPTIONS

4.1.4 Network to Network Interface(NNI) Orderable Options

The Access Seeker may select Standard (up to 10km) or Long Haul (up to 40km) capable interfaces. As a result of these options, interconnect to the NNI can be made by direct fibre connection and Access Seekers should not require equipment to be located at NBN Co PoI premises.

Further details are provided in the Technical Specification.

NNI Port		
Interface Speed	Description	Comments
1Gbps	1000BaseLX- 10Km range	
1Gbps	1000BaseZX-40Km range	
10Gbps	10GBaseLR-10 Km range	
10Gbps	10GBaseER-40Km range	
Link OAM	Monitor service in real time and diagnostic capability	For Business Services
Protected NNI	Redundancy options at the NNI	
Expedited Installation	set up NNI at faster than std provisioning time	
Modifications	changes of speed or feature	

TABLE 4.5 – NNI OPTIONS

5 Service Management

NBN Co's system architecture is built around the key principles of Service Provider enablement and automation. By placing the management controls of each End User service in the hands of the corresponding Access Seeker, operational overheads and manual order processing are minimised.

NBN Co system interfaces will span across a number of different domains as shown in Figure 5.1

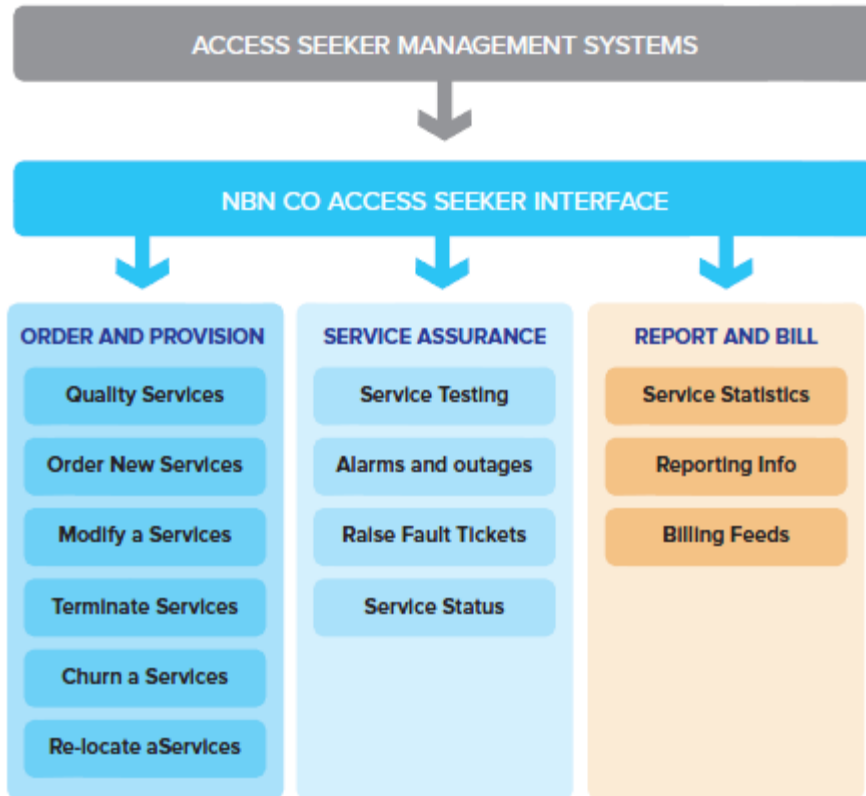


FIGURE 5.1 - SERVICE MANAGEMENT DOMAINS

Details will be provided in the Service Management and Operations Manual and the Systems Manual.

6 End User Premises

NBN Co will supply, install and maintain a Network Termination Unit (NTU) including external antenna at each end-user premises. Further details will be provided in the Deployment Guide.

7 NWA Access Configuration Examples

The following examples illustrate NWA use in the typical delivery of residential and business applications offered by Access Seekers. They outline both equipment and service configuration arrangements, and how components of NWA can be utilised in varying service delivery environments.

7.1 Residential Gateway Internet and VoIP Connection

The Residential Gateway illustration shows residential connection for voice, video and data and the gateway CPE is the responsibility of the End User or the Access Seeker. The selection of gateway equipment will be determined by the Access Seeker and End User, depending on the Access Seeker retail service model and feature requirements.

The NTU connects to End User equipment, typically via a Residential Gateway, which maintains the Access Seeker IP address required for the network connection. Figure 7.1 shows three gateway traffic classes (TCs), terminating on a single NTU port.

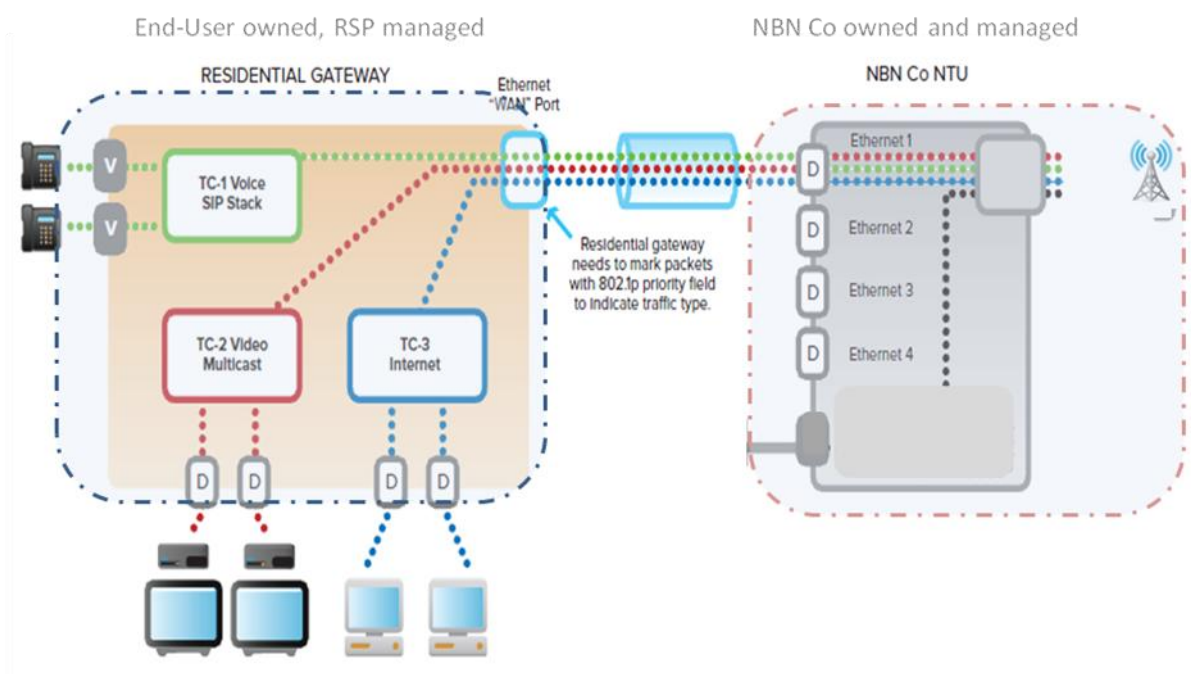


FIGURE 7.1 – RESIDENTIAL GATEWAY

7.2 Access Seeker UniCast IPTV Services

IPTV services can be delivered over the NNAS network as ‘over-the-top’ services. Figure 7.4 illustrates the service environment.

IPTV and VoD services can be delivered to the user residential gateway or set-top box as part of the normal internet access service IP data bitstream by an Access Seeker with the appropriate content serving infrastructure.

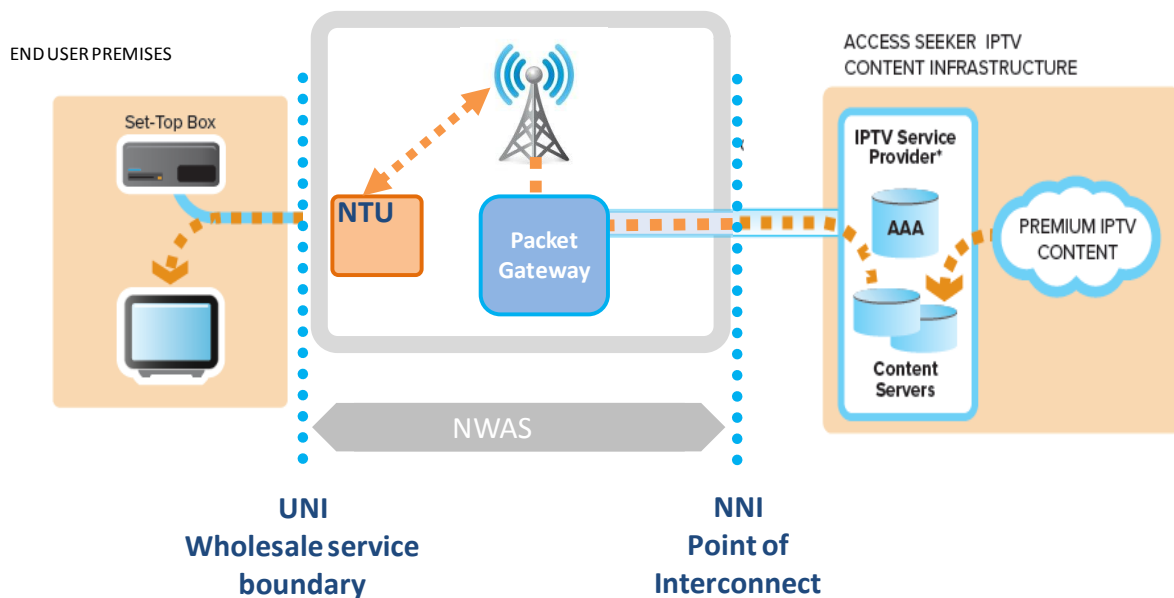


FIGURE 7.2 – UNICAST IPTV SERVICE DELIVERY

8 Annexure A1 – Information and Document Hierarchy Release Schedule

Following is a draft document hierarchy and draft schedule dates.

POI Consultation Paper:	A paper in relation to NBN Co's POIs.
Product Overview	<p>A high level product and pricing structure document that provides the Access Seeker sufficient product description details to identify key architectural and business considerations required to use the NFAS service, including:</p> <ul style="list-style-type: none"> • Product Components • Product Ordering Catalogue • Application Examples
NWAS Pricing Guide	The NWAS product price list, charge structure and conditions.
Rollout Schedule	Indicative NWAS national network rollout locations and dates.
NWAS Product Technical Specification	<p>The NWAS Technical Specification comprehensively defines the product technical details, ordering information and service levels.</p>
Service Management and Operations Manual	<p>A service manual that defines operational processes, service levels, including:</p> <ul style="list-style-type: none"> • B2B Interface • Ordering Services • Service Modification • Churn Process • Service Qualification • Assurance Process • POI setup and management

Deployment Guide	<p>A manual that defines the geographical and physical aspects of the network rollout and related party obligations, including:</p> <ul style="list-style-type: none"> • In building cabling • Demarcation Points • Service Testing • Power requirements • Space Requirements • Environmental • Migration
Systems Manual	A manual that defines operational, systems and Access Seeker Business to Business IT and network interfaces.

8.1 Document Availability Schedule.

POI Consultation Paper	Sept 2010
Product Overview	Sept 2010
NWAS Pricing Guide	
Initial Indicative Rollout Schedule	
NWAS Product Technical Specification	
Service Management and Operations Manual	
Deployment Guide	
Systems Manual	

9 Annexure A2 – Document Glossary of Terms

The following words, acronyms and abbreviations are referred to in this and related documents.

ADSL/DSL (Asymmetric Digital Subscriber Line): A technology used for sending broadband data over a conventional copper telephone line. Actual speeds are distant dependent.

AVC: Access Virtual Circuit: A dedicated Ethernet Virtual Circuit that connects the UNI to one CVC.

ATA: Analogue Telephone Adapter is a device used to connect one or more standard telephones to a digital system such as VoIP network.

BNG: Broadband Network Gateway: An IP routing device that maintains a table of IP network addresses, utilised predominantly for managing Internet networks.

Broadband: A network service which provides high speed access to the internet or a term used to describe a high speed transmission network.

CIR: Committed Information Rate: CIR defines a level of data throughput for which service frames are delivered unconditionally.

CVC: Connectivity Virtual Circuit: A shared Ethernet Virtual Circuit that connects one or more AVCs to a NNI.

DSL (Digital End User Line): General name for range of technologies that offer broadband over copper access networks, including ADSL and VDSL.

End User: An end user that acquires (or proposes to acquire) a service from an Access Seeker for final consumption by that end user.

End User Premises: The premises of an End User to which a carriage service is or will be supplied.

Ethernet: A common interface and transmission technology which allows computers and devices to communicate on a network.

EBS: Ethernet Bitstream Service: The hierarchy term that defines wholesale consumer based services delivered by NBN Co. It is a Wholesale Layer 2 Ethernet access service that uses the CVC and the AVC to connect from the POI to End User premises.

EVC: Ethernet Virtual Circuit: A logical Ethernet channel between UNI and NNI.

FAN: Fibre Access Node: The facility that houses the active electronic equipment for the Fibre Access Node (the OLTs and EFSS). It may or may not be the POI location.

FSA: Fibre Serving Area: A geographic area covered by one or more Passive Optical Networks (PONS) terminating at the same FAN.

FTTP: Fibre-to-the-Premises: An optical fibre access network structure in which the optical fibre extends directly from the End User's premises to the carrier transmission network. A number of technologies can be used, with GPON being a commonly implemented FTTP technology.

GPON: Gigabit Passive Optical Network: A shared fibre network architecture that can be used for next generation broadband access.

MDU: Multi Dwelling Unit: A multi-tenanted residential or business building.

MEF: Metro Ethernet Forum: A global body of network operators and equipment vendors with the common goal of promoting the use of Carrier Ethernet.

Multicast: Multicast is a special IP protocol which enables a single device to communicate with a specific multiple set of hosts (ie point to multipoint communication). This allows for communication that resembles a conference call

NFAS: NBN Co Fibre Access Service: The umbrella term used to describe NBN Co wholesale fibre services.

NGN: Next Generation Network, including FTTP, wireless and satellite access technologies

NNI: Network to Network Interface: The Access Seeker physical point of network connection to NFAS located at the POI. Typically a 1Gbps or 10Gbps optical transmission interface.

NTU: Network Terminating Unit. A generic term for network equipment at the End User premises which provides a point for network demarcation.

OAM: Operations, administration and Maintenance

OLT: Optical Line Terminating Unit: The FAN equipment that interfaces to the passive optical network.

OSI: Open System Interconnection: Reference model for network infrastructure. An international recognised standard based model that defines a network element hierarchy.

Premises: A physical location yet to be precisely defined.

PIR: Peak Information Rate: PIR defines the maximum data throughput that may be achieved on a given circuit.

POI: Point of Interconnect: A demarcation and network connection point between carriers.

PoP: Point of Presence: Closest Access Seeker location to a POI.

Service Providers (SPs): Companies which provide services, such as telephone or internet services, to a customer's home or business, collectively referred to as Access Seekers in this document.

Splitter: A piece of equipment used in fibre optic technology which splits a beam of light into a number of optical light signals.

UNI: User Network Interface: The physical End User access point and point of network demarcation – in this case, an Ethernet connector.

Unicast: Unicast IP data is data sent from one host to another host, when one device transmits a message destined for one receiver (ie point to point communication).

VDSL2: Very high bitrate DSL: An upgrade to ADSL technology which allows for very fast internet access over copper lines. It is likely to be the technology which will be used in MDU deployments.

VoIP: Voice over IP – Voice services carried over a packet digital IP network.