COMMUNICATIONS ALLIANCE LTD

NATIONAL BROADBAND NETWORK

WHOLESALE SERVICE DEFINITION FRAMEWORK – TELEPHONY ACCESS SERVICE

RELEASE 1

2010

National Broadband Network Wholesale Service Definition Framework – Telephony Access Service

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1 INTRODUCTION

1.1 General

1.1.1 This document has been developed by the Wholesale Services working group of the Communications Alliance National Broadband Network (NBN) Project. It provides a framework and template for the definition of wholesale services that may be available on the NBN and potentially by other Telephony Service Providers (TSPs).

1.1.2 Some areas of this service definition template will need to be populated by the TSP with values for the service attributes in accordance with the network design and service characteristics.

1.2 Relationship with other Communications Alliance NBN Working Groups

1.2.1 The work of the Wholesale Services working group is related to activities within other NBN Project working groups in Communications Alliance. The general relationships can be seen in Figure 1.

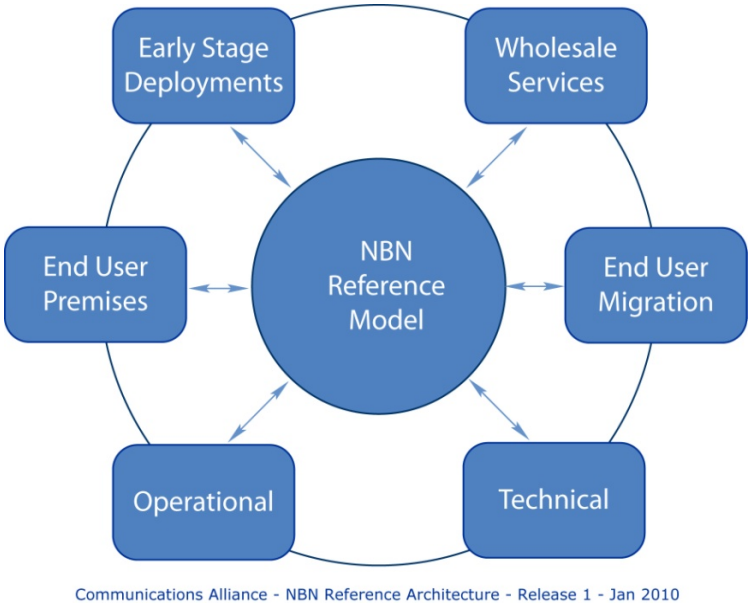

FIGURE 1

Communications Alliance NBN Project Working Group Structure

1.2.2 The Wholesale Services working group is one of seven working groups established by Communications Alliance to address industry requirements for the National Broadband Network (NBN). The other six working groups address:

(a) **NBN Reference Model** - The NBN Reference Model working group has developed a reference model that seeks to identify within the NBN framework:

- the roles and responsibilities of Service Providers,
- key principles related to End Users,
- key principles related to Services, and
- key principles related to Interconnection of Networks.

(b) **Technical** – The Technical working group has identified the generic elements in the passive optical infrastructure, appropriate international standards (or domestic standards and codes if available) and their features which meet the characteristics required by the wholesale services, to demonstrate that the wholesale services can be implemented, and to facilitate the sourcing and configuration of network elements.

(c) **Early Stage Deployments** - The Early Stage Deployments working group has developed guidelines for infrastructure for Fibre To The Premises (FTTP) developments, plus information to guide stakeholders such as planning authorities, approvals bodies, premises owners and constructors that draws upon industry best practices.

(d) **End User Premises** - The End User Premises working group has developed advice on NBN installation practices for end-user premises, guidelines on in-premises distribution and suggested procedures for testing and provisioning services. The types of end-user premises include business, residential (including multi-dwelling), government, educational, infrastructure and backhaul sites.

(e) **End User Migration** - The End User Migration working group is defining processes, procedures and systems requirements to smooth the movement of services between the existing networks and the NBN.

(f) **Operational** – The Operational working group is proposing approaches to enable the best possible customer experience in provisioning, assurance and billing of NBN services.

1.3 Scope

1.3.1 This document provides:

(a) a framework for the definition of a Wholesale Telephony Access Service that may be available on the NBN and potentially by other Wholesale Telephony Access Service Providers.

(b) a description of the key capabilities to be specified in the Wholesale Telephony Access Service.

1.3.2 This document does not address:

(a) end-to-end characteristics of a telephony service.

(b) regulatory aspects for a telephony service such as emergency calling, lawful interception, preselection, number portability.

(c) interconnection arrangements.

(d) the routing of calls.

(e) all potential service types that could be delivered through the Reference Architecture and which may potentially be defined in future versions of this work.

NOTES:

1. There are a number of possible wholesale services that could be utilised for the delivery of a telephony application. The options presented in this paper do not preclude other methods for the delivery of telephony.

2. Communications Alliance work to date has produced Release 1 of the Wholesale Service Definition Framework – Ethernet paper. The framework in this paper could be utilised to deliver a telephony application that relies on a Layer 2 Ethernet wholesale carriage service for transport.

3. The Wholesale Telephony Access Service leverages the Ethernet framework and couples it with an Analogue Terminal Adaptor (ATA) deployed at the end user premises.

4. This Service Description Framework will form the foundation block for further work around the provision of telephony (i.e. voice and related services such as fax, modem, etc.).

5. This document presents a range of scenarios and options that Communications Alliance working groups have identified with the purpose of facilitating broader NBN discussion and decision making for NBNs. It does not represent the preferred position of Communications Alliance, its individual members, or the communications industry.

2 ABBREVIATIONS, DEFINITIONS AND INTERPRETATIONS

2.1 List of terms

A current list of terms and their definitions is available at:
https://commswiki.dgit.biz/index.php/Agreed_Term_Definitions

2.2 Definitions and Abbreviations

Refer to Table 1 for a list of definitions and associated abbreviations used in the Guideline.

TABLE 1

Abbreviations and Definitions for Terms

Term	Abbreviation (where relevant)	Definition	Comments / References
Carriage Service Provider	CSP	a person who supplies a carriage service to the public using network units owned by one or more carriers.	Section 87 of the *Telecommunications Act 1997*.
National Relay Service	NRS		Section 95 of the *Telecommunications (Consumer Protection and Service Standards) Act 1997*.
Retail Telephony Service	RTS	A Telephony Service provided by a retail Telephony Service Provider.	This may be provided by using a Wholesale Telephony Access Service, but may also be provided via other means.
Service Provider	SP	as a stand alone term "Service Provider" is defined in section 86 of the Telecommunications Act 1997 as: "(a) a carriage service provider; or (b) a content service provider."	There are legislative consequences for "service providers." As far as possible the term should be avoided as a stand-alone term.
Wholesale Telephony Access Service	WTAS	A wholesale service offered by an NBN provider that is a combination of an ATA function in the ONT, associated analogue ATA port(s), and logical connectivity to a Point of Interconnect.	This does not address end-to–end requirements. This is not limited to voice telephony e.g. it could be for fax, tones, etc.

2.3 Other Abbreviations

Other abbreviations used in the Guideline and their meanings are:

3GPP	3rd Generation Partnership Program
AMR	Adaptive Multi-Rate
AMR-NB	Adaptive Multi-Rate Narrowband
AMR-WB	Adaptive Multi-Rate Wideband
ASP	Application Service Provider
ATA	Analogue Terminal Adaptor
BBF	Broadband Forum
BNG	Broadband Network Gateway
BR	Border Router
CA	Communications Alliance
CBS	Committed Burst Size
CIR	Committed Information Rate
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CoS	Class of Service
CSP	Content Service Provider
C-TAG	Customer VLAN Tag
DECT	Digital Enhanced Cordless Telecommunications
DHCP	Dynamic Host Configuration Protocol
DHCPv6	Dynamic Host Configuration Protocol for IPv6
DTMF	Dual-tone multi-frequency
DTX	Discontinuous Transmission
EAS	Ethernet Access Switch
EFTPOS	Electronic Funds Transfer at Point of Sale
EUP	End User Premises
FTTP	Fibre To The Premises
IAD	Integrated Access Device

ID	Identity
IEEE	Institute of Electrical and Electronic Engineers
IETF	Internet Engineering Task Force
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISDN	Integrated Service Digital Network
L2	Layer 2
L2TP	Layer 2 Tunnelling Protocol
L3	Layer 3
LAC	L2TP Access Concentrator
LNS	L2TP Network Server
MAC	Media Access Control
MEF	Metro Ethernet Forum
MEGACO	Media Gateway Control Protocol
MMTel	Multimedia Telephony
NBN	National Broadband Network
NNI	Network to Network Interface
NSP	Network Service Provider
NTU	Network Termination Unit
OAM	Operations Administration and Maintenance
ODF	Optical Distribution Frame
OLT	Optical Line Terminal
OMCI	ONT Management Control Interface
ONT	Optical Network Termination
POI	Point of Interconnection
PON	Passive Optical Network
POTS	Plain Old Telephony Service
PSTN	Public Switched Telephone Network

QoS	Quality of Service
RFC	(IETF) Request For Comments
RG	Residential Gateway
RSP	Retail Service Provider
RTCP-XR	Real Time Control Protocol – Extended Reports
RTP	Real Time Protocol
SBP	Service Boundary Point
SIP	Session Initiation Protocol
SIPPING	Session Initiation Protocol Project INvestiGation
SLA	Service Level Agreement
SMS	Short Message Service
SNMP	Simple Network Management Protocol
TISPAN	Telecommunications and Internet converged Services and Protocols for Advanced Networking
TSP	Telephony Service Provider
TTY	Teletype
UNI	User Network Interface
VAD	Voice Activity Detection
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
VRRP	Virtual Router Redundancy Protocol
WTAS	Wholesale Telephony Access Service
xDSL	Digital Subscriber Line technologies (e.g. ADSL, VDSL, etc.)

NOTE: For more information on:
(a) 3GPP refer to http://www.3gpp.org/
(b) the BBF refer to http://www.broadband-forum.org/
(c) the IEEE refer to http://ieee.org/
(d) the IETF refer to http://ietf.org/
(e) the MEF refer to http://metroethernetforum.org/index.php
(f) TISPAN refer to http://www.etsi.org/tispan/

3 WHOLESALE BROADBAND SERVICES OVERVIEW

3.1 Communications Alliance NBN Reference Architecture

3.1.1 The Reference Model working group of the Communications Alliance NBN Project has defined a reference model in the paper *National Broadband Network Reference Architecture – High Level Architecture Options for the NBN*. This reference model is used to put into context the wholesale services definitions within this document. Figure 2 illustrates the reference model for the use of Fibre To The Premises (FTTP) in the access domain. The paper has a similar but separate model for the use of terrestrial wireless and/or satellite technologies.

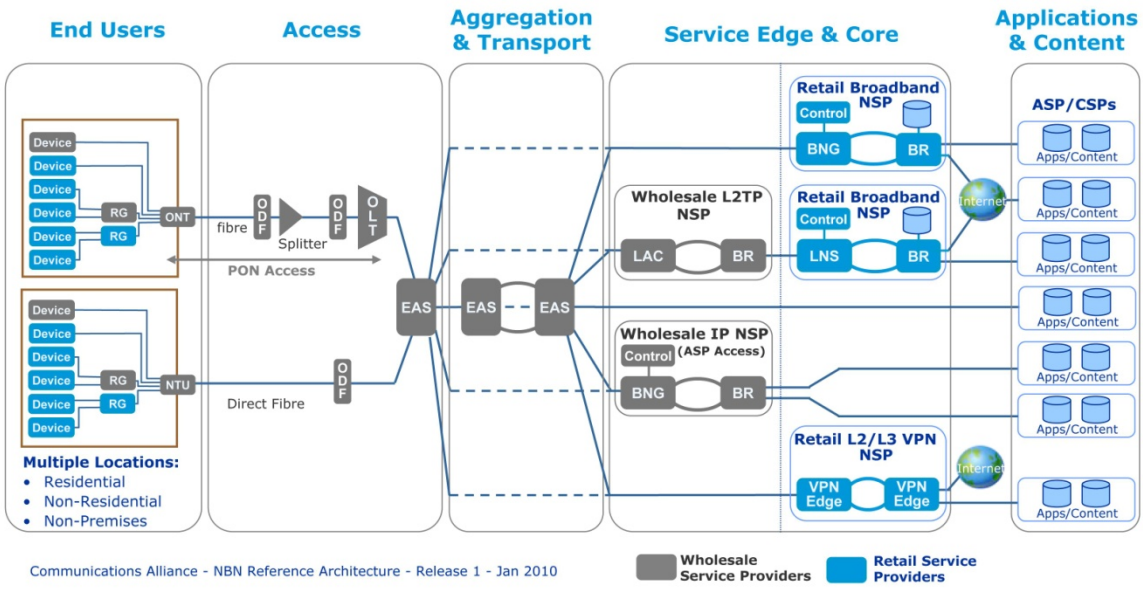

FIGURE 2

Broadband Network Reference Architecture - FTTP Access

3.1.2 It is intended that, as much as is possible, the reference architecture in Figure 2 will be applicable to the delivery of the wholesale telephony services, defined in this document, across all access technologies.

3.2 Service Boundary Points (SBPs)

3.2.1 The reference architecture describes a number of types of services. The services defined in this template relate to telephony wholesale services. The wholesale telephony access services are defined to operate between an analogous point to reference point 3 (e.g. an ATA port on an ONT) at the end-user location and a POI, reference point 3a or 3b as shown in Figure 3 (for FTTP access). The description of reference points 3, 3a and 3b is provided in the *National Broadband Network Reference Architecture – High Level Architecture Options for the NBN* paper.

3.2.2 It should be recognized that the SBP, reference point 3, at the end-user premise is located such that a Network Termination Unit (NTU) device exists that is considered a component of the Broadband Access Provider network.

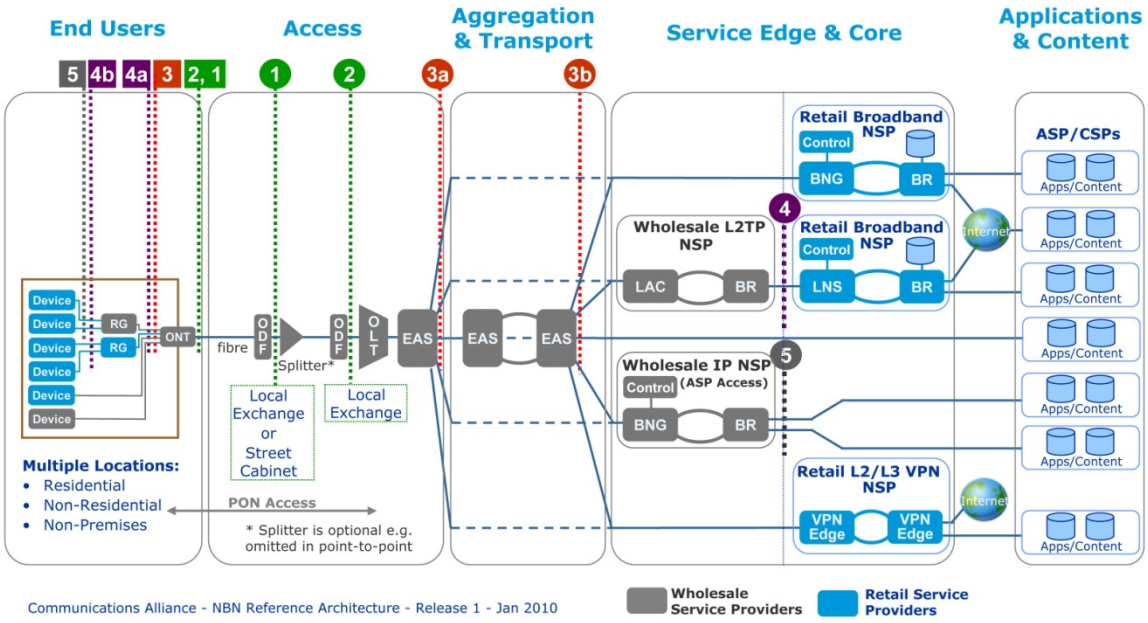

FIGURE 3

Reference Model Wholesale Point of Interconnect and Service Boundary Point Scenarios – FTTP Access

4 WHOLESALE TELEPHONY ACCESS SERVICE DEFINITION

4.1 Introduction

4.1.1 In the industry consultation paper released by the NBN Co. on 21 December 2010, NBN Co. states the following for support of a Plain Old Telephone Service (POTS) service.

> "As a means to aid transition from current access technologies to the NBN, inclusion of Plain Old Telephone Service (POTS) capability is being considered to support legacy telephony services."
> "It is proposed that this will be achieved via an Analogue Telephone Adapter (ATA) integrated within the Optical Network Termination (ONT). Session Initiation Protocol (SIP) will form the core of the interface definition for this capability. Further details of the implementation of the POTS capability will be released in due course."

4.1.2 Service definition templates for the Wholesale Telephony Access Service (WTAS) are described in the following sections.

4.1.3 POTS is considered within this document to refer to "narrowband audio" as defined for codec types in ITU-T Y.2201 Clause 14.2.2.

NOTE: Codec types continue to be developed to support a wider range of audio fidelity levels classified as:

- *"narrowband audio" for audio range of 300Hz to 3400Hz;*
- *"wideband audio" for audio range of 50 Hz to 7000 Hz;*
- *"super wideband audio" for audio range of 50 Hz to 14000 Hz;*
- *"full band audio" for audio range of 20Hz ~ 20,000Hz, with associated multi-channel capabilities (mono, stereo, etc).*

However, POTS handsets only support a narrowband experience.

4.2 Characteristics of a Wholesale Telephony Access Service (WTAS)

4.2.1 A Retail Telephony Service is characterised by:

(a) Customers' continued ability to use their existing telephone handset.

(b) A feature set that may be different to the feature set on the current PSTN telephony service. Which telephony features retail TSPs will provide will be determined by a combination of individual RSPs' commercial decisions, Government

policy and regulatory requirements, all of which are outside the scope of Communications Alliance work.

(c) Real-time service quality (i.e. low IP Transfer Delay, low IP packet Delay Variation, low Packet Loss Ratio).

(d) 'Carrier grade' service quality (e.g. Quality of Service, audio quality and availability approximating current PSTN quality).

4.2.2 "Wholesale Telephony Access Service" is defined as the wholesale function provided by the NBN provider, which is the combination of various product components such as an ATA function in the ONT and connectivity to an NNI at a Point of Interconnect (POI), allowing a TSP to deliver Retail Telephony Services.

4.3 Architecture Overview

4.3.1 Figure 4 shows a high level architecture for a Retail Telephony (POTS-like / POTS-minus) Service.

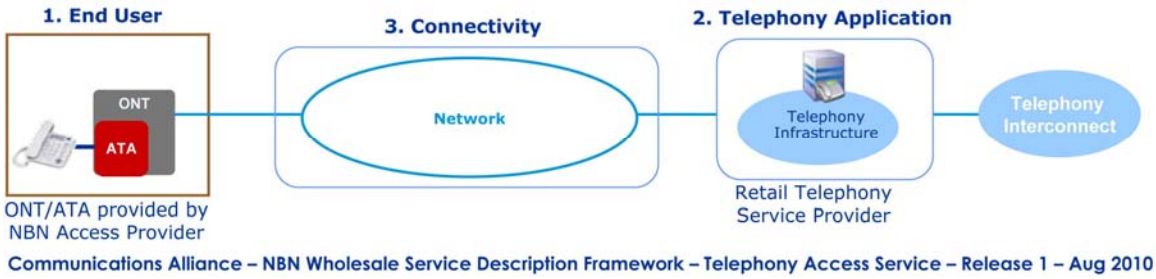

FIGURE 4
High Level Telephony Service Architecture

4.3.2 The main elements of the architecture in Figure 4 are:

(a) ATA function in the ONT

(i) supporting existing POTS handsets for voice (telephony);

(ii) converting non-IP voice signals to Voice over Internet Protocol (VoIP) e.g. for use with SIP/ Real Time Protocol (RTP), or H.248/RTP;

(iii) supporting and interacting with the Retail Telephony Provider's Infrastructure for call control and telephony features (e.g. fax, 3 way conferencing, calling line identity display); and

(iv) provided by the Wholesale Telephony Access Provider.

NOTES:

1. *There is different industry terminology for the ATA function. Other terms include Integrated Access Device (IAD) and Voice Gateway (VGW).*

2. *ETSI standards (e.g. refer to ETSI ES 282 002, ETSI TS 183 043) support both PSTN and ISDN Emulation, using SIP and H.248.*

(b) Telephony Application

(i) provides the telephony call control and features; and

(ii) is provided by retail TSPs.

(c) Network Connectivity

(i) provides the connectivity between the ATA function and Telephony Application; and

(ii) includes IP addressing, guaranteed bandwidth/Quality of Service (QoS), security and reliability.

NOTE: While telephony interconnection is shown, interconnection is the responsibility of the retail TSP.

4.3.3 Figure 5 shows more detail of the architecture, expanding the connectivity details. The Access and Aggregation domains are aligned with the Communications Alliance *NBN Reference Architecture – High Level Architecture Options for the NBN* paper. Key points include:

(a) The end user SBP is the analogue or ISDN telephony port on the ONT.

(b) The TSP SBP is the NNI at the Point of Interconnect.

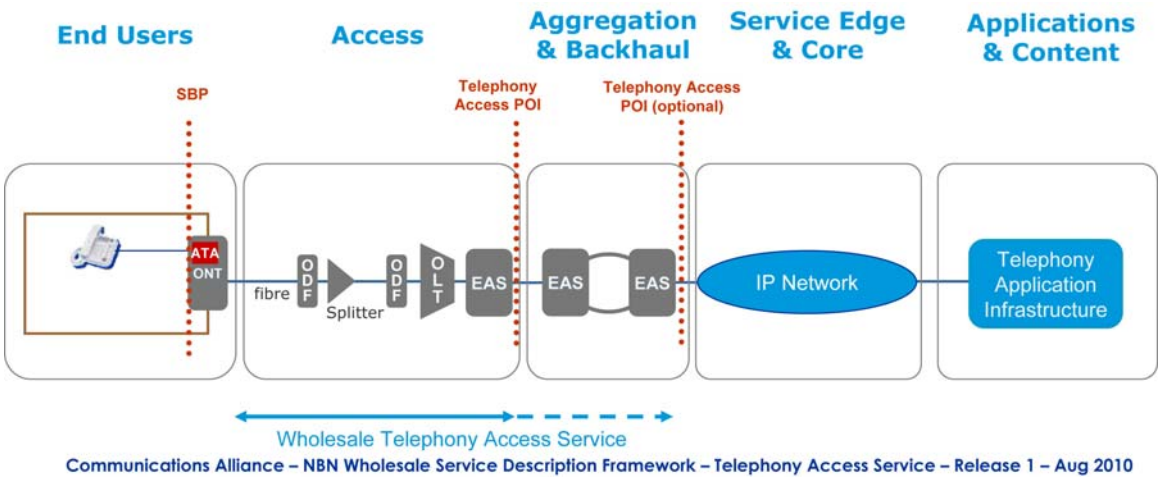

FIGURE 5

Telephony Service Architecture – showing connectivity

4.3.4 Figure 6 shows the logical interactions between the ONT ATA function and the Telephony Application Function. This includes:

(a) Signalling (e.g. SIP and/or H.248);

(b) Media (RTP);

(c) Management and Operations (e.g. for provisioning, diagnostics); and

(d) IP Connectivity to ATA.

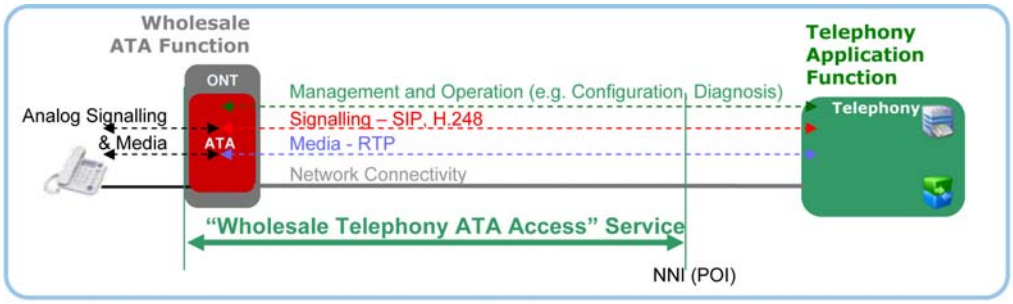

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FIGURE 6

ATA to Telephony Provider interactions

4.3.5 Figure 7 shows four basic industry options for a retail TSP delivering telephony services using the Wholesale Telephony Access Service:

(a) IMS based: MMTel or PSTN Emulation Server with IMS core.

(b) SIP based: SIP Application Server on a SIP Core.

(c) H.248 based: Use a Softswitch.

(d) H.248 based: Use PSTN switch via a V5.2 Gateway.

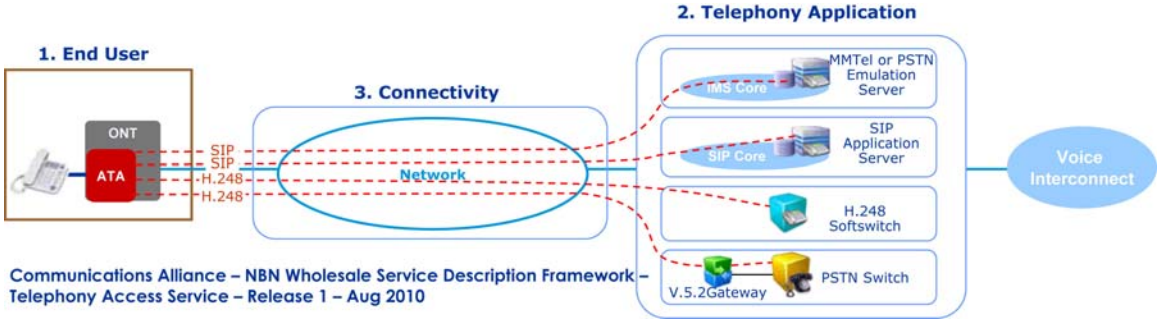

Figure 7

Architecture options for Telephony Application using the Wholesale Telephony Access Service

4.3.6 The ATA will need to support SIP and where technically or commercially feasible should support H.248 to support the different Telephony Application solutions in clause 4.3.5 and Figure 7 by the retail TSPs. While SIP is the preferred technology option in the longer term, H.248 should also be supported to enable a smooth transition from the current telephony solution (e.g. H.248 is in use today to support POTS over FTTP access in some greenfield sites).

NOTES:

In terms of telephony features:

1. Many features are implemented in the Application Server only, and do not require standardisation, nor support in an ATA.

2. Various supplementary service features have been standardised (e.g. in IMS MMTel, TISPAN PSTN Emulation Service and H.248) to ensure operability between an ATA and an Application Server. In general, an ATA needs to support certain features if the RSP is to deliver these standardised supplementary services.

3. Some features have been standardised by H.248, but are still either being developed under TISPAN PSTN Emulation, or not currently defined by TISPAN PSTN Emulation (e.g. Payphones). Consequently, SIP/IMS support for certain PSTN features is considered at an early stage of maturity in the industry.

4. If the wholesale TSP implements enhancements to the SIP and H.248 protocols then they shall be supported in accordance with industry standards (e.g. as developed by 3GPP, ITU-T, IETF).

4.4 Service Scope

4.4.1 Figures 8, 9 and 10 show the boundaries for the Wholesale Telephony Access Service. The retail TSP purchases:

(a) Access to the ONT ATA facility; and

(b) Connectivity services between the ONT and the NNI at the Point of Interconnect.

4.4.2 Three potential connectivity options are shown in Figures 8, 9 and 10. These options are described in more detail in section 6.3.

NOTES:

1. The WTAS provider will need to identify options that the RSP can purchase (e.g. QoS, POI bandwidth).

2. Refer to the Notes to section 6.3 for more information on the connectivity options.

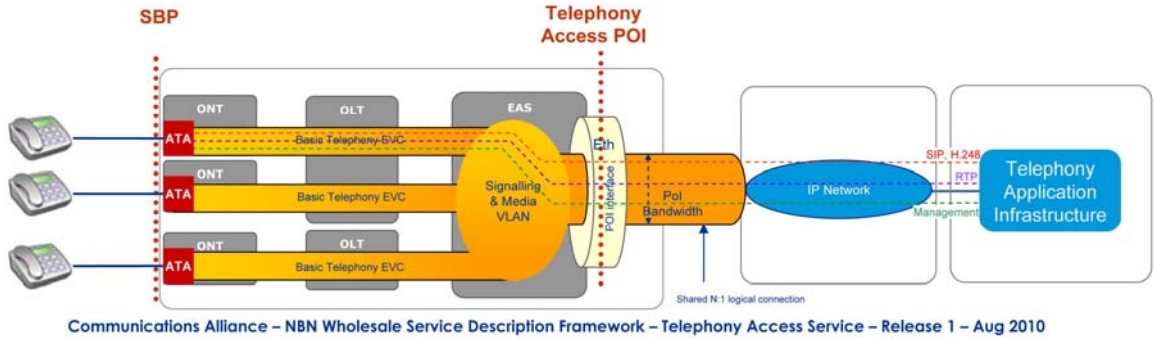

Figure 8

Wholesale Telephony Access Service (N:1 VLAN per POI Model)

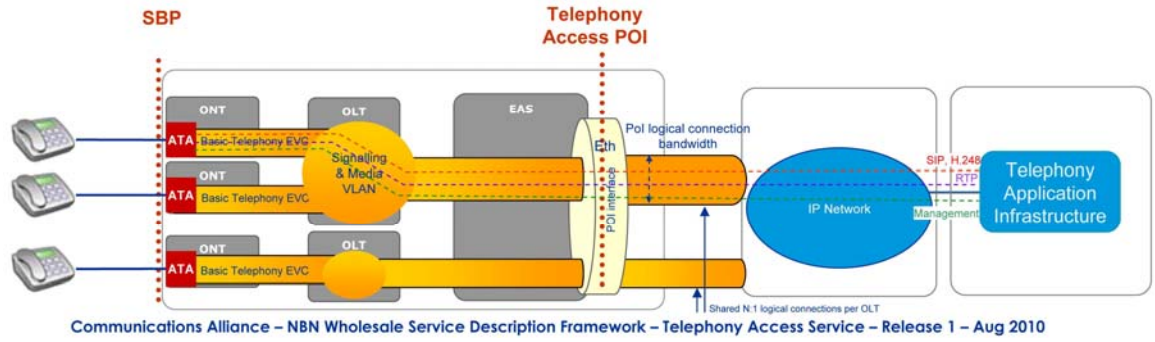

Figure 9

Wholesale Telephony Access Service (N:1 VLAN per Access Node Model)

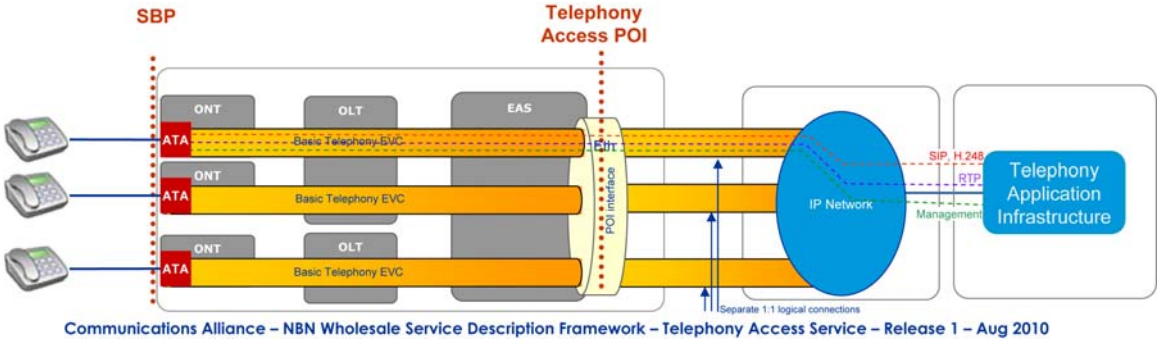

Figure 10

Wholesale Telephony Access Service (1:1 VLAN Model)

NOTES:

1. To deliver a 'carrier grade' telephony service using the ATA function in the ONT, a retail TSP also needs telephony application infrastructure which delivers many of the telephony service features. However, certain capability also needs to be supported in the ATA in the ONT to deliver certain end-to-end services (e.g. fax, modem, 3 way conferencing, call on hold, etc.).

2. Refer to Section 5 for more detail on the capability to be supported in the ATA in the ONT.

5 ATA FUNCTIONAL CHARACTERISTICS

5.1 Introduction

5.1.1 To enable retail TSPs to deliver 'carrier grade' telephony services over NBN FTTP access using an ATA, the ATA will require a range of capabilities.

5.1.2 The full technical requirements for an ATA will depend on the telephony features to be provided by retail TSPs. What telephony features retail TSPs will provide will be determined by a combination of individual RSP's commercial decisions, government policy and regulatory requirements, all of which are outside the scope of this document.

5.1.3 This section lists high level key technical requirements by reference to existing POTS features. These will be necessary to the extent that the retail TSPs desire or are required to provide these features. Note that the following features are high level requirements only, not full technical specifications for an ATA.

NOTE: Some features have been marked as desirable. Such features may be difficult to support today given the maturity of industry implementations.

5.2 Signalling Protocol support

5.2.1 The Wholesale Telephony Access Service shall support SIP. The following protocols shall be supported in an ATA:

(a) Session Initiation Protocol (SIP) – refer to IETF RFC 3261 – and related protocols;

(b) User Equipment basic signalling requirements as specified in 3GPP IMS Release 8 (or later) (refer to 3GPP 24.229) and TISPAN IMS (refer to ETSI ES 283 003).

5.2.2 Where technically and commercially feasible, the Wholesale Telephony Access Service should also support H.248, as per ITU-T Recommendation H.248.1 and related recommendations.

NOTES:

1. While SIP is the agreed long term direction, there are currently different views on whether or not an ATA should support H.248.

One view is that H.248 should be supported by the ATAs because:

- *it is used today to deliver voice services over FTTP;*
- *H.248 is more mature in terms of support of existing POTS features (today);*
- *There is better feature transparency with POTS services (today); and*

- *It will minimize customer impacts and migration issues during the transition.*

Another view is that H.248 should not be supported by the ATAs because:

- *support for H.248 by ONT vendors is declining; and*
- *some existing vendors have it is as a candidate for removal.*

2. What telephony features retail TSPs will provide will be determined by a combination of individual RSPs' commercial decisions, Government policy and regulatory requirements, all of which are outside the scope of Communications Alliance work.

3. H.248.1 was also known as IETF RFC 3015 Media Gateway Control (or MEGACO).

4. 3GPP IMS MMTel and TISPAN PSTN Emulation are also known as IMS based SIP.

5.2.3 The Wholesale Telephony Access Service Provider may have the capability to configure each ATA port to use one of the above signaling protocols.

5.3 Telephony Feature support

5.3.1 Some supplementary services are network based and have no specific requirements in the ATA (therefore out of scope for this document). The Wholesale Telephony Access Service ATA should not preclude delivery of these services by the retail TSP.

5.3.2 The Wholesale Telephony Access Service shall support the following basic telephony services in order to facilitate delivery of a RTS that complies with regulatory and Industry Code requirements:

(a) Calling Line Identification Presentation (CLIP);

(b) Calling Line Identification Restriction (CLIR);

(c) Calling Number Display (inbound and outbound);

(d) National Relay Service and TTY; and

(e) Ring Cadences and Dial Tones.

5.3.3 Where it is technically and commercially feasible the Wholesale Telephony Access Service should support basic telephony supplementary services as defined in IETF RFCs, 3GPP MMTel (3GPP Release 8) and TISPAN PSTN Emulation (in the ATA) including:

(a) 3 Party Call;

(b) Call Waiting (CW);

(c) Call Hold/Enquiry;

(d) Message Wait Indication (MWI) (including stutter tone);

(e) Advice of Charge (desired)

(f) Explicit Communication Transfer (ECT);

(g) Dual-tone multi-frequency (DTMF); and

(h) Dial Plan.

NOTES:

1. The ATA shall support industry standard options for both in-band and out-of-band signalling. A telephony service may implement either, or both, in-band or out-of-band signalling. Suggested methods for support of DTMF include RFC2833/RFC4733 for out-of-band and audio G.711 for in-band signalling

2. If the above features are not supported on the ATA, then customers will not be able to use these features on the WTAS.

3. Advice of Charge is required for Payphones and Private Metering. While standards have been developed, industry support might be immature.

5.3.4 Where it is technically and commercially feasible the Wholesale Telephony Access Service should support the following features to support legacy PSTN services (in an ATA/IAD):

(a) Fax service (e.g. via T.38, V.152 protocol);

(b) Modem service (e.g. via V.150.1, V.152 protocols) (for EFTPOS, security diallers, etc.);

(c) SMS on Fixed (dial-up modem support); and

(d) Hotline.

NOTES:

If the above features are not supported on the ATA, then customers will not be able to use these features on the WTAS.

Options to support voiceband data network devices through voiceband data (e.g. V.152) include:

- *Use of clear channel G.711 with echo cancellation turned off; and*
- *Negotiation to use Fax over IP (e.g. T.38) or Modem over IP.*

The choice of implementation method to support voiceband data network devices is a decision for the Service Provider and is not addressed in this document.

5.3.5 The following legacy PSTN service features are considered desirable for support by the Wholesale Telephony Access Service (in an ATA/IAD)

(a) ISDN Basic Rate (Q.931 on customer side, ISDN Emulation);

(b) Payphones (refer to H.248.26 and/or H.248.34, TS 183 043) Advice of Charge, Analogue Pulse Metering/Line Reversal);

(c) Line specific features such as Line Reversal, Flash Hook and Distinctive Ringing;

(d) Other services that operate over the current POTS (e.g. personal emergency response services).

NOTES:

1. If ISDN services are to be migrated to the NBN, then the ability for ISDN Basic Rate to be provided "over the top" of an NBN service is required. This could be achieved using commonly available external ISDN Emulation TAs (if the WTAS does not support ISDN).

2. TISPAN PSTN/ISDN Emulation defines how ISDN Basic Rate could be supported. While standards exist, industry support may be immature.

3. Similarly, while PSTN Emulation standards define support for other features, industry support may be limited.

5.4 Codecs

5.4.1 The Wholesale Telephony Access Service shall support the ITU-T G.711 A-law audio media format (i.e. codec).

NOTES:

1. Support of G.711 A-law facilitates interworking with existing telephony services on the PSTN and the ISDN.

2. Support of G.711 A-law facilitates support of fax and modem tones.

3. In Australia the use of G.711 A-law is more widespread than G.711 μ-law and this is assumed to continue for the foreseeable future.

5.4.2 The following codecs are desirable for Wholesale Telephony Access support, to enable transcoder free operation with other networks:

(a) ITU-T G.711 μ-law;

(b) ITU-T G.722;

(c) ITU-T G.729 (G.729A is also acceptable) and associated VAD/DTX annexes;

(d) 3GPP AMR (refer to 3GPP TS 26.071, also known as AMR-NB); and

(e) 3GPP AMR-WB (refer to 3GPP TS 26.171 and to ITU-T G.722.2).

NOTES

1. Support of ITU-T G.711 μ-law encoding facilitates interworking with North American equipment operating in its default state.

2. Support of ITU-T G.722 and AMR-WB encoding facilitates interworking with other endpoints that support wideband coding. The current industry support for analogue wideband voice user equipment is limited however increased demand for G.722 and G.722.2/AMR-WB may emerge in future.

3. Support of ITU-T G.729 encoding facilitates interworking with existing low bit rate telephony services. The predominant use of FTTP for access and associated bandwidth availability suggests use of ITU-T G.729 may decline over time.

4. Support of AMR-NB facilitates interworking with mobile telephony, to allow transcoder free operation with some types of mobile devices.

5. This list does not preclude the use of other codecs.

6. For more information on VoIP parameters (e.g. frame sizes, jitter buffers, echo cancellation) refer to Communications Alliance guidelines G632 and G634.

5.5 Numbers of basic telephony ports

5.5.1 An ATA should support multiple telephony ports.

5.5.2 An ATA should support multiple customer lines when using different ATA ports from the same retail TSP, or different retail TSPs.

NOTE: Support for more than one telephony provider per NTU will involve additional technical and operational complexity for service providers and end users.

5.6 ATA Port

Layer 1 Physical Interface Options

The ATA shall support existing handset physical connector types. Refer to section 4.11 of the National Broadband Network End-User Premises Handbook for more information on connector types.

5.7 ATA Configuration Methods

5.7.1 The IP addressing for the ATA is the responsibility of Retail Service Providers.

NOTE: IP address assignment to the ATA and the configuration of the ATA should be done securely, ensuring the confidentiality and integrity of configuration data.

5.7.2 The ATA shall support both the:

(a) IPv4 protocol (IETF RFC 791 and related specifications); and

(b) IPv6 protocol (IETF RFC 2460 and related specifications).

NOTES:

1. From an industry perspective, public IPv4 address space is running out. IPv6 is the accepted industry direction.

2. It is a Retail Service Provider's decision as to whether it continues to use IPv4 addressing (either public or private) or IPv6 addressing. The Retail Service Provider view is that IPv6 needs to be supported on the ATA to facilitate evolution to IPv6 in the future.

5.7.3 The ATA shall support dynamic IP address assignment to simplify operations by the retail TSP.

5.7.4 There are two options for how the ATA will support address assignment capabilities:

(a) Dynamic Host Configuration Protocol (DHCP): Where IP address (and other parameters) are assigned via the Retail Service Provider, independent of the Wholesale Telephony Access Provider's management system. DHCP is a standard industry practice for IP address assignment. DHCP specific support shall include:

(i) DHCP (refer to RFC 2131);

(ii) relevant DHCP options;

(iii) Dynamic Host Configuration Protocol for IPv6 (DHCPv6) (refer to RFC 3315); and

(iv) relevant DHCPv6 options (refer to RFC 3319).

(b) ONT Management and Control Interface (OMCI): IP address (and other ATA parameters) are assigned via the WTAS Provider's management system. The RSP needs to interact with the WTAS Provider's management.

NOTES:

1. There are alternate views on methods of IP address assignment to be supported (i.e. option (a) and/or (b) above).

Those in support of option (a) highlight that DHCP is a standard industry practice for IP address assignment. It would provide a consistent approach with the delivery of telephony services via other means. It would also simplify operational aspects, including adds/moves/changes. This is more consistent with the current RSP approach for address assignment, and is simpler for the RSP.

Those in support of option (b) highlight that a retail TSP will need to implement an interface to the WTAS provider's B2B management system (via OMCI) for the purpose of configuring the ATA settings that are not related to network connectivity. For example, B2B will be used to provision SIP parameters, ring tones, dial plans, impedances, etc. (Note: If ITU-T G.984.4 options for file configuration or TR-069 support are implemented, the RSP could use this mechanism for dynamic configuration of many ATA parameters).

In other words, the B2B management interface needs to be completed for other configuration tasks and so a neater solution is to use the Management Interface for all configuration tasks, including network connectivity.

Vendor support among GPON ONT vendors is inconsistent for DHCP (both IPv4 and IPv6) and this may necessitate the use of the management interface.

2. See Section 6.5 on Line Identity for information on Option 82 and DHCPV6.

5.7.5 The WTAS should support different methods for ATA configuration as per ITU-T G.984.4.

NOTES:

1. Similar to IP Address assignment options, standards have defined that other ATA SIP parameters can be configured in the ONT either via a management system or dynamically.

2. ITU-T G.984.4 identifies 4 options for VoIP service configuration:

- *OMCI (i.e. use a management system).*
- *File retrieval.*
- *DSL Forum TR-069 (also known as Broadband Forum TR-069).*
- *IETF SIPPING config framework.*

5.8 Ancillary capability – Security

5.8.1 If the Wholesale Telephony Access Service supports DHCP, then the Wholesale Telephony Access Service Provider shall support Line ID insertion into DHCP (Option 82) (to support one form of registration security).

5.8.2 Where a Wholesale Telephony Access Service supports a N:1 connectivity model, then the wholesale TSP shall implement MAC spoofing protection (e.g. at the OLT).

5.8.3 The ATA shall support security requirements including:

(a) authentication of signalling;

(b) integrity of signalling; and

(c) confidentiality of signalling.

5.8.4 Where technically and commercially feasible the ATA should support signalling and media security requirements as defined in 3GPP (refer to 3GPP 33.203) and TISPAN (refer to ETSI TS 187 003) IMS specifications, including:

(a) Authentication of signalling;

(b) Integrity of signalling; and

(c) Confidentiality of signalling.

NOTE: There are alternate views on the applicability of IMS security requirements to the legacy Wholesale Telephony Access Service provided on the ATA port.

There is a view that development of rich media type IMS features and supplementary services will be primarily directed at services utilizing the data ports on the ONT.

The analogue nature of the WTAS ATA port, legacy WTAS feature set, and uncertain technical maturity do not warrant the mandatory application of these specifications to the WTAS.

The other view is that standards have defined security specifications to mitigate various threats. Retail TSPs may be implementing security for multimedia calling services (to native SIP endpoints), and would benefit from having a consistent security approach across all products.

5.9 Ancillary capability – power supply

Refer to section 4.9 of the *National Broadband Network End-User Premises Handbook* for information on a power backup source including the option for the end user to have battery backup to allow the telephony service to operate when local power fails.

6 CONNECTIVITY CHARACTERISTICS

6.1 Introduction

POI characteristics are to be based on the *National Broadband Network Wholesale Service Definition Framework – Ethernet* paper.

6.2 Interface specifications at the Point of Interconnect

The POI shall support Ethernet (i.e. IEEE 802.3) interfaces. For more information refer to the:

(a) *National Broadband Network End-User Premises Handbook*; and

(b) *National Broadband Network Wholesale Service Definition Framework – Ethernet* paper.

6.3 Logical connection from an ATA

6.3.1 The Points of Interconnect shall allow the option for different services (e.g. voice, broadband) to be combined on a single physical link, but kept logically separated.

6.3.2 The Wholesale Telephony Access Service shall provide redundancy options to improve fault tolerance and availability.

6.3.3 There are three potential options for how the Wholesale Telephony Access Service will support the logical connection from an ATA as shown in Figures 8, 9 and 10.

6.3.4 Where technically and commercially feasible, the Wholesale Telephony Access Service shall support both N:1 and 1:1 VLAN models.

NOTES:

There are three potential technical options for providing connectivity from the ATAs to the PoI, as summarised below.

In considering the requirements for connectivity to the ATA, it should be recognised that connectivity is only a component of the overall service. As such, the WTAS connectivity component should be optimised for supporting the end-to-end Telephony Access Service.

Each of the different options have different scaling, cost and operational implications for the WTAS provider and retail TSPs as summarised below.

Option 1: N:1 VLANs per PoI.

This model provides a single multipoint connection between a large number of ATAs and the PoI. Ethernet MAC learning/switching is used to forward traffic to individual ATAs. Characteristics of this model include:

- *A small number of multipoint layer 2 interfaces are required at the PoI. This means that general purpose switch/router platforms can be used by the RTSP at the PoI.*

- *The WTAS provider must implement MAC layer switching technology. This may have significant scalability and cost implications for the WTAS provider PoI switch.*

- *Simple provisioning of the RTSP PoI router since individual access services do not need to be provisioned there. In particular, per-service traffic management is not required because the traffic has effectively already been shaped by the voice codec to the appropriate rate.*

- *PoI redundancy is simpler to implement (compared to the 1:1 model used for data services) due to the inherent multipoint capability of the N:1 model. Standard redundancy protocols such as VRRP (refer to RFC 3768 for IPv4, or RFC 5798 for Ipv4 and Ipv6) can be used by the RTSP to provide redundant connectivity at the PoI in a manner transparent to the WTAS provider (i.e. failover from an active to a standby PoI is under the control of the RTSP without requiring specific protocol support within the WTAS provider network and without requiring signalling between the RTSP and the WTAS provider networks.*

Option 2: N:1 VLANs per Access Node.

This model is very similar to option 1 except that the scope of the N:1 VLAN is restricted to a single Access Node. This means that the requirement to support MAC layer switching is distributed across a number of Access Nodes thereby limiting the scalability impact for the WTAS provider. For the RTSP on the other hand, this model has only minor additional scaling requirements at the PoI compared to option 1. In addition, this model facilitates per Access Node traffic management.

Option 3: 1:1 VLANs per ATA.

The 1:1 VLAN model provides a point-to-point layer 2 connection from each ATA to the Point of Interconnect (PoI). The characteristics of this model include:

- *Each PoI will potentially be required to support tens of thousands of individual voice VLAN connections in addition to the individual VLAN connections required for Data services. This may have significant scalability and cost implications for the RTSP.*

- *As each individual Wholesale Telephony Access Service is activated, an additional VLAN interface must be provisioned on the RTSP PoI switch/router.*

- *Redundancy can be implemented using standard approaches such as IEEE 802.1AX Link Aggregation (previously referred to as IEEE 802.3ad) which requires signalling*

interaction between the WTAS Provider and RTSP to effect failover.

- *A more consistent approach with the Wholesale Service Definition Framework – Ethernet paper, which specifies 1:1 VLAN delivery.*

6.4 Bandwidth and QoS

6.4.1 The wholesale TSP shall provide the option to mark signalling and media traffic at Layer 2 (i.e. Ethernet) and Layer 3 (i.e. IP DiffServ – refer to IETF RFCs 2475 and 4594) at the POI (in the upstream direction) with coding as specified by the retail TSP.

6.4.2 The wholesale TSP shall not modify the marking of signalling and media traffic at Layer 2 (i.e. Ethernet) and Layer 3 (i.e. IP DiffServ – refer to IETF RFCs 2475 and 4594) at the POI in the downstream direction.

6.5 Line Identity

6.5.1 If DHCP is supported, then IPv4 DHCP relay agent capability including Option 82 shall be supported, to allow the retail TSP to obtain line identity information for the Telephony Service.

6.5.2 If DHCPv6 is supported, then the Wholesale Telephony Access Provider shall support a Lightweight DHCPv6 Relay Agent (LDRA) to encode access loop identification in the Interface-Id Option (option 18) and use the "Relay Agent Remote-Id" Option (option 37).

NOTES:

1. Option 82 provides Line identity information.

2. Line identity may be used for different purposes (e.g. registration authentication, security, location)

3. The NBN Wholesale Service Definition Framework – Ethernet paper describes the ability for Line Identity using DHCP Relay.

4. The Wholesale Telephony Access Service Provider and retail TSP must share a common understanding on the format of the Line ID, whether specified by the WTAS provider or RTSP.

5. Broadband Forum (BBF) TR-101 details line identity details relevant to IPv4 while the requirements for IPv6 are still being established through BBF activities WT-187 IPV6 for PPP and WT-177 Migration to IPv6 in the context of TR-101. The requirements predominantly apply to DHCP relay functions within the Access Node and BNG.

7 PERFORMANCE, SERVICE LEVEL AGREEMENTS & REPORTING

7.1 Target Performance Values

The wholesale TSP shall achieve target performance values to allow retail TSPs to meet regulatory obligations (e.g. customer service guarantee, national reliability framework, priority assistance, etc.) applicable to the Wholesale Telephony Access Service.

> *NOTE: For more information on defining and testing Quality of Service for IP networks and for VoIP services refer to Communications Alliance industry guidelines G632, G633, G634 and G635.*

7.2 Performance Monitoring capability

7.2.1 Where commercially and technically feasible the Wholesale Telephony Access Service should support the capability for the Retail Service Provider to invoke performance measurements (between the ATA and POI, and for end-to-end service measurement).

7.2.2 The Wholesale Telephony Access Service Provider should support the following protocols:

(a) ITU-T Rec. Y.1731; and

(b) IETF RFC 3611.

> *NOTES:*
>
> *1. ITU-T Rec. Y.1731 recommends Operations Administration and Maintenance (OAM) functions and mechanisms for Ethernet based networks and is used for performance monitoring.*
>
> *2. IETF RFC 3611 specifies the RTP Control Protocol Extended Reports (RTCP XR).*

7.3 Performance Reporting

The Wholesale Telephony Access Service Provider should regularly provide performance reports to Retail Voice Service Providers.

8 CONFORMANCE TESTING

8.1 Support ATA specification feature and compliance statement

The Wholesale Telephony Access Service Provider shall supply standards and feature compliance statements of the ATA capability.

8.2 Interoperability testing with Voice Service Provider capability

The Wholesale Telephony Access Service Provider shall provide a facility to allow retail TSPs to undertake interoperability testing between the ATA in the ONT and the TSP's Network and Applications.

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COMMUNICATIONS ALLIANCE LTD

Level 9
32 Walker Street
North Sydney
NSW 2060 Australia

Correspondence
PO Box 444
Milsons Point
NSW 1565

T 61 2 9959 9111
F 61 2 9954 6136
TTY 61 2 9923 1911
E info@commsalliance.com.au
www.commsalliance.com.au
ABN 56 078 026 507