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Temporary Special Services White Paper

Ethernet-Lite and Wholesale BDSL on the **nbn**™ Ethernet Bitstream Service

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Appendix: Comparison Table

nbn provides product capability to enable the industry to develop solutions for the migration of SHDSL-based business services to the national broadband network.

nbn provides key product capabilities suitable to support the migration pathway for SHDSL-based exchange-fed copper services including Telstra's retail offering 'Ethernet-Lite' and Telstra's Wholesale equivalent 'Wholesale BDSL' to the **nbn**™ Ethernet Bitstream Service (NEBS).

NEBS can help the industry simplify and standardise the provisioning and management of their access infrastructure around solutions comprised of the fibre-based access technologies of FTTP[1], FTTN[2] and FTTB[3]. It also offers a range of Enhanced Service Levels providing additional support to Business End Users.

The purpose of this White Paper is to outline how **nbn**'s product capabilities can enable the industry to develop business packages and bundles that are the same as, or better than their legacy copper-based equivalents (TSS Equivalent Services).

Temporary Special Services (TSS) are a set of telecommunication products delivered on copper, primarily targeted at the business market. The complete list of more than 20 Telstra Retail & Wholesale Special Services is available on **nbn**'s website[4]. This White Paper is aimed at the two TSS product classes of Ethernet-Lite and Wholesale BDSL. These services provide WAN-based connectivity between sites for the delivery of business and collaboration solutions and as a high speed Layer 2 access to the internet.

This is the first in a series of White Papers to illustrate the capability of the **nbn** as a suitable migration pathway for TSS services. For the full schedule of White Papers, please refer to the Integrated **nbn**™ Product Roadmap on **nbn**'s website[5]. This is a White Paper published by **nbn** in accordance with the Subscriber Agreement between **nbn** and Telstra.

[1] FTTP refers to Fibre to the Premises

[2] FTTN refers to Fibre to the Node

[3] FTTB refers to Fibre to the Building

[4] http://www.nbnco.com.au/connect-home-or-business/information-for-home-or-business/will-it-work-over-the-nbn/what-services-will-be-switched-off.html

[5] http://www.nbnco.com.au/content/dam/nbnco/documents/Integrated-Product-Roadmap.pdf

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Key Benefits of the **nbn™** Ethernet Bitstream Service

Consistent End User experience

NEBS services receive a consistent set of minimum speeds, features and capabilities[6]. Service Providers do not require different encapsulations or 'conversion modes' based on the access network or the WAN head-end - it is all Ethernet.

Simple deployment

nbn handles the installation of the requisite plant and equipment up to the network boundaries for each access technology using a standard deployment process wherever practical, and non-standard installations where required. For services delivered using fibre-based FTTP, **nbn** delivers the service to an Ethernet port on an **nbn**-provided Network Termination Device (NTD). For fibre-based FTTN, **nbn** provides a VDSL2 service to the first socket at the Business End User's premises, and for fibre-based FTTB, **nbn** provides the service to the Main Distribution Frame (MDF). The Service Provider then selects a VDSL2 compliant modem suitable to support the associated value proposition for their Business End User and installs the VDSL2 modem equipment beyond the first socket (FTTN) or MDF (FTTB) at the Business End User's premises.

Clear reliability target

The network availability target for NEBS is 99.90% and **nbn** has openly defined its calculation methodology in its Wholesale Broadband Agreement.

Customer independence

Business End Users can choose their Service Provider for their services based on the Service Provider's overall value proposition, upstream engineering and strengths in other areas important to the End User. Service Providers can be confident in the knowledge that the basic 'last mile' behaviours of NEBS will be consistent and predictable. The Business End User can also change Service Providers without physically modifying the NEBS installation or, for fibre-based FTTP, the NTD.

Enhanced Service Levels offers certainty to businesses

nbn offers a range of enhanced service levels for assurance that provide a level of certainty around how quickly services will be restored in the event of a service outage.

Service installation targets

Once **nbn** declares a location to be serviceable, service installation target timeframes are between 9 and 19 days, depending on the site's location and the remaining work required. In urban areas, this could mean **nbn**'s installation targets are up to 40% lower when compared to existing copper-based services using Ethernet-Lite or Wholesale Business DSL targets.

[6] Some minimum speeds features and capabilities may not be available for fibre-based FTTN and fibre-based FTTB where the Line Rate of the service cannot accommodate this.

Service Overview

In today's networking world, Ethernet access services offer a superior mix of speed, cost, equipment support and simplicity. NEBS fibre provides a Layer 2 Ethernet-based connectivity circuit between a Business End User's premises and a Point of Interconnection (POI). If **nbn** deploys fibre-based FTTP, it replaces an existing copper access service with fibre all the way to the Business End User's premises. For services delivered via fibre-based FTTN or FTTB, the length of the copper access service path is optimised for broadband speeds by placing a DSLAM either in, or as close as reasonable and practicable, to the End User premises.

When NEBS is delivered via the FTTP network, the virtual circuit is terminated on a Gigabit Ethernet port on the **nbn™** NTD. For services delivered across FTTN/B, the Service Provider (or Business End User) can select any VDSL2 equipment that is compatible with the **nbn™** technical specification and satisfies the value proposition for their intended Business End User. **nbn** publishes the criteria and specification to ensure equipment compatibility, but ultimately, to provide flexibility to the Service Provider and their Business End Users.

Best Practice and Industry Standards Alignment

nbn solutions deliver consistent, predictable performance and business-level reliability for Service Providers and their Business End Users.

The architecture of **nbn**'s infrastructure follows international design practices and already complies with Metro Ethernet Forum (MEF) standards. **nbn** is currently exploring implementing official MEF certification based on the existing NEBS solution in the first half of 2016. MEF certification requires certification of a UNI to NNI connection where both handoff points are Ethernet.

In addition, ITU-T Y.1731[7] is widely used by the **nbn** teams for internal network management purposes, and all the benefits of **nbn**'s widespread adoption of this standard are passed on to the Service Provider.

[7] ITU-T Y.1731 provides standards-based Ethernet performance monitoring that encompasses the measurement of Ethernet frame delay, frame delay variation, and frame loss and throughput as outlined in the ITU-T Y-1731 specification and interpreted by the Metro Ethernet Forum.

What is Traffic Class 2 (TC-2) and how does it work?

nbn's Traffic Class 2 capability provides Service Providers and their Business End Users with performance objectives covering bandwidth, delay, jitter and packet loss:

Traffic Class	nbn™ Network	Frame Delay (one way)	Frame Delay Variation	Frame Loss
TC-2	NEBS-FTTP	≤ 6 ms	≤ 10 ms	≤ 0.01%
	NEBS-FTTN/B	≤ 25 ms	≤ 16 ms	≤ 0.04%

TC-2 is engineering to address the needs of business services that require tighter performance commitments than a 'best-efforts' solution, such as those carrying high-bandwidth, real-time, interactive multimedia applications. Every NEBS fibre[8] service may be configured to use TC-2 by selecting a bandwidth rate from a flexible menu of standardised profiles.

The TC-2 traffic performance undertakings for bandwidth are enforced by a set of values prescribing burst rates. For TC-2 class traffic, a bi-directional, fixed burst period of 10 ms applies. The NEBS product is built of two key logical components that are dimensioned by the Service Provider to deliver the value proposition required to secure their target business market.

What is an AVC?

The NEBS Access Virtual Circuit (AVC) provides a direct, one-to-one connection at Layer 2 between the Service Provider and its Business End User premises. Traffic crossing the AVC is structured to identify the owning customer, and moves securely through the NEBS infrastructure between the Service Provider's connection to the POI/NNI on one side and the Ethernet interface on the **nbn**-provided NTD or the UNI on the Service Provider-/Business End User-provided modem on the other. This gives the Service Provider a high degree of control and management over many aspects of service configuration and performance.

When **nbn** terminates the Ethernet service on an NTD it does so on an Ethernet interface. For fibre-based FTTP, the maximum size of an Ethernet frame at the UNI-D depends on the presence of 802.1Q tags, but is never less than 1,992 bytes. For fibre-based FTTN/B, the maximum size of an Ethernet frame at the UNI-DSL also depends on the presence of 802.1Q tags, but is never less than 1,518 bytes from destination MAC Address to Frame Check Sequence (FCS) inclusive, which matches standard Ethernet behaviour.

AVC Bandwidth options

NEBS gives Service Providers the bandwidth capacity and flexibility to control their End User's traffic profiles. Each AVC automatically supports a TC-4 subscription, which is a 'best-efforts' bandwidth allocation. At order time, Service Providers may choose an AVC profile that allows it to carry an amount of TC-2 traffic to support the provision of high-bandwidth, business-critical interactive multimedia applications. The TC-2 bandwidth capability of up to 20 Mbps on fibre-based FTTN/B, or 40 Mbps on fibre-based FTTP, matches or exceeds the upper end of many DSL-based retail Ethernet services available in the Australian market today. **nbn** also provides differing modes of addressing the Traffic Class 2 AVCs at the UNI, including Default-Mapped, DSCP, Priority-Tagged and Tagged options.

What is a CVC?

The NEBS connectivity virtual circuit (CVC) collects AVCs from a connectivity serving area (CSA) and presents them in an aggregated bundle to the Service Provider at the POI/NNI, again using a selectable mix of highly scalable, cost-effective and widely supported physical Ethernet interfaces. A single CVC may contain AVCs that are presented to End Users and delivered across all access technologies.

The maximum Ethernet frame size at the POI/NNI depends on whether a particular AVC is presented to a UNI-D or UNI DSL. For an AVC to a UNI D, the maximum Ethernet frame size is 2,000 bytes, which comfortably exceeds the maximum size of a standard Ethernet frame. For an AVC to a UNI-DSL, the maximum Ethernet frame size is 1,526 bytes from destination MAC to FCS (inclusive), which matches standard Ethernet behaviour for double-tagged (802.1ad) frames.

[8] NEBS fibre refers to either: Fibre to the Premises (FTTP), Fibre to the Node (FTTN) or Fibre to the Building (FTTB)

CVC Bandwidth options

CVC bandwidth profiles are flexible and can be 'mixed-and-matched' between traffic classes to achieve a granular assortment of traffic class capacities. The CVC profile is a customised set of single traffic class-specific values. The Service Provider may choose a particular bandwidth for one traffic class independently of the bandwidth chosen for another traffic class on the same CVC. In some cases, the CVC might only specify and carry one or two of the available traffic classes if it has no need to support the others.

The speed tiers for each traffic class on a CVC are always symmetric, even for those (like TC-4) that are asymmetric when considered for an individual AVC.

Symmetric speed tiers available		
TC-1 traffic class speed tiers	5, 10, 20, 25*, 30*, 40*, 50, 60*, 80*, 100, 120*, 150, 200, 250, 300, 400 and 500 Mbps	✓
TC-2 traffic class speed tiers	5*, 10*, 20*, 25*, 30*, 40*, 50, 60*, 80*, 100, 120*, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900 and 1000 Mbps	✓
TC-4 traffic class speed tiers	50, 100, 150, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, and 2000 to 10,000 Mbps (in 100 Mbps increments*).	✓

* These additional CVC speed tiers across TC-1, TC-2 and TC-4 are being introduced in November 2015.

Contention Management

The NEBS interconnection architecture allows each Service Provider to use the aggregating CVC into a serving area to directly influence its Business End Users' traffic experience. **nbn** does not prescribe the AVC bandwidth ratios applied to a CVC, so the Service Provider is free to scale the CVC to either:

- Protect the performance metrics for that class for traffic crossing each AVC; or
- Experience a high degree of contention among AVCs, to strike an economic balance between performance and cost.

Provided the Service Provider doesn't oversubscribe the CVC, and maintains an average utilisation level that does not exceed the recommendations for NEBS (70%), the general performance levels of TC-2 are expected to provide an appropriate migration path for existing SHDSL-based exchange-fed copper services available in Australia today. Customers are responsible for testing the operation of their services, including contention and dimensioning, to ensure they obtain desired performance and other service characteristics.

Traffic Class Signalling

NEBS fibre is designed to allow the Service Provider and/or Business End User's equipment to set the IEEE 802.1Q PCP field in the Ethernet header of a tagged Ethernet frame presented at the UNI or POI/NNI. By using this field, the frame can declare the traffic class membership (TC-1, TC-2 or TC-4) for the journey over the AVC while leaving the IP Precedence/DSCP field to signal end-to-end Class of Service (CoS).

For the purposes of CPE compatibility and/or management simplicity, the Service Provider or Business End User may prefer to use the IP Precedence/DSCP field in an IP packet, or employ a default class membership for every frame at the UNI. NEBS can also support this requirement and **nbn** has published the required values for IP Precedence/DSCP mapping of each traffic class.

Compatible NTD CPE

For services delivered using FTTP, **nbn** delivers the service to an Ethernet port on an **nbn**-provided Network Termination Device (NTD). The **nbn** NTD is installed on the inside of an external wall of the Business End User premises.

The **nbn**-provided NTD has the following UNI-D ports:

- Four electrical 10/100/1000 BASE-T Ethernet UNI-D ports

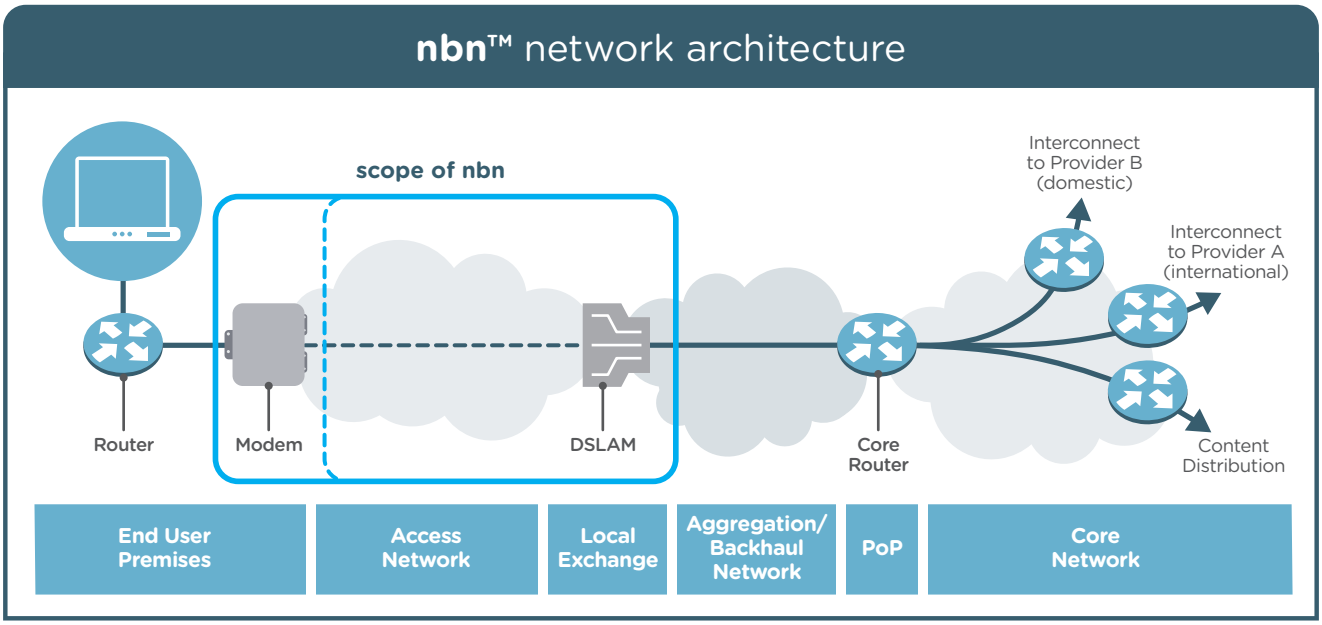
The NTD is capable of servicing a maximum aggregate traffic throughput of 1 Gbps downstream and 1 Gbps upstream in total across all UNI ports.

For services delivered using FTTN/B, the service is delivered over copper, as is today's practice with the existing Telstra Ethernet Lite offering.

For fibre-based FTTN, **nbn** provides a VDSL service to the first socket at the Business End User's premises, whilst for fibre-based FTTB the service is provided at the Main Distribution Frame (MDF). The Service Provider then provides a VDSL2-capable modem installed beyond the socket (FTTN) or MDF (FTTB) at the Business End User's premises. The VDSL2 equipment hardware and firmware intended for use with the UNI-DSL must support full-vectored interoperability with all of the DSLAM chipsets and firmware combinations as specified by **nbn**.

Simplified Network Architecture without Major End-Customer Change

The variant of **nbn**'s NEBS fibre solution involved will either modify or replace the existing copper access provided as part of a current SHDSL service. The solution aggregates end users within a service area and backhauls their Ethernet traffic to and from an NNI/POI for interconnection to the Service Provider. This is consistent with broadband architectures used in Australia and other parts of the world, and helps to limit forced changes at the Business End User's premises. The diagram shows an illustrative comparison of the scope of the **nbn** access replacement versus a traditional DSL network.



For the Service Provider, the use of **nbn**'s NEBS fibre service will see the modification, replacement or elimination of these access components, depending on the access technology:

- The SHDSL network terminating unit (NTU) will be replaced with an **nbn**-supplied NTD for FTTP or a Service Provider-/Business End User-supplied VDSL2 modem for FTTN/B
- The Copper Access service will be replaced with fibre for FTTP or modified by nbn for FTTN/B
- DSLAM infrastructure will be removed for FTTP or replaced by **nbn** for FTTN/B

The result is a simplified network for the Service Provider, with a standardised Ethernet access virtual circuit terminating at the Business End User's premises either on an **nbn**-provided NTD or on a Service Provider selected VDSL2 compatible modem.

Commercial Advantage

For a Service Provider, **nbn**'s TC-2 and Enhanced Service Levels for assurance would be considered cost inputs into an end-to-end solution offered to a Business End User i.e. **nbn**'s TC-2 will be one of the many costs and input parameters in the overall solution. **nbn**'s product capabilities provide attractive commercial pricing for Service Providers to deliver a financially viable End User solution.

Highly Secure

As NEBS uses GPON infrastructure, traffic is highly secure as a traffic encapsulation method called GEM that applies AES 128 encryption is applied to all transmissions. The encryption is applied at the **nbn**-provided NTD. Each NTD is managed and controlled by **nbn**, excluding direct management access by the Service Provider or Business End User.

AES 128 with a good quality key is generally acknowledged to be very resistant to unsophisticated cracking attempts, so **nbn** believes fibre-based FTTP offers good quality protection against such attacks on its shared access network. The fibre-based FTTN/B does not require the same traffic encapsulation and encryption methods as it does not use a shared resource in the last mile, but provides the Business End User with a dedicated access tail, in the same way as SHDSL-based exchange-fed copper services today.

Network Demarcation

The proposed **nbn** replacement of SHDSL services will not result in any change to the demarcation points for End Users. The Business End User will still be presented with a standard copper interface in the case of FTTN or FTTB, while for FTTP, the Business End User will be presented with an Ethernet port on an NTD. The migration to a NEBS fibre-based service will result in new ingress and egress demarcation points for the elements delivered by **nbn**. This may result in some changes to the Service Provider's operational processes similar to the upgrade experience of migrating ADSL services to **nbn**-based offerings.

Sophisticated Customer Reporting, Monitoring and Diagnostics Tools

Customer reporting

A key element of the migration of SHDSL services to the **nbn™** network is the ability for the Service Provider to continue to deliver a level of reporting services to its Business End Users.

nbn provides Service Providers with a series of service management and self-management tools to support core operational functions including ordering, activation, management and assurance across all **nbn™** product and access technologies, including fibre.

Service management information will be accessible via four methods:

1. Database access via the B2B interface
2. An online, browser-based graphical management dashboard
3. Standardised reports with regular delivery timeframes, including regulatory and technology-specific reports that roll up to the dashboard
4. Customised ad-hoc and incident-based reports including the ability for the Service Provider to build their own specific reports.

Self-Service tools will be accessible by two methods:

1. B2B interface into testing tools and database
2. An online, browser-based graphical dashboard

Customer reporting tools available and in plan as part of nbn's NEBS service		
Connection reporting	By status, geography and priority, connection appointment performance	✔
Order and ticket management	Including AVC and CVC MACS performance, fault rectification performance	✔
Network availability	Network availability, sortable by geography, product, volume of Service Providers impacted (updated hourly)	✔
Operational Support tools	• Dashboard reporting on incidents • Monthly trouble ticket reporting • Total active services by product type • Reports on Response KPI performance • Port error statistics	✔

Internal reporting, monitoring and diagnostics

The offering based on **nbn**'s NEBS fibre services provides the Service Provider a range of diagnostics capabilities:

Diagnostics Capabilities		
UNI-D NTD Status (NEBS-Fibre)	Retrieves information about the UNI-D port from the Access Network. **Key attributes:** • NTD Status Information • UNI-D Status Information **Diagnostic uses:** • General information about the NTD/UNI port and its operational status	✓
Loopback Connectivity Test9 (NEBS-Fibre)	Ethernet OAM based end-to-end connectivity test (for fibre based FTTP based services only) **Key attributes:** • Loopback test result (i.e. pass/fail) • Number of packets sent vs. number of packets received • Number of out-of-order packets **Diagnostic uses:** • Troubleshooting connectivity issues • Aid in fault localisation (be it in a Service Provider's or **nbn**'s network) in the form of Y.1731 loopback (LBM/LBR)	✓
Performance Tests10 (NEBS-Fibre)	Testing of services over a fixed period of time to provide performance metrics (Frame Delay, Frame Delay Variation, Frame Loss Ratio) **Key attributes:** • Frame Delay • Frame Delay Variation • Frame Loss Ratio **Diagnostic uses:** • Troubleshooting throughput related issues • Ensuring end to end performance of service (Ethernet layer) within **nbn**'s network according to product specifications as specified in the product specification document using Y.1731 (DMM/DMR)	✓

[9] The Internal loopback test for fibre based FTTN/B is run between the NNI and DSLAM port

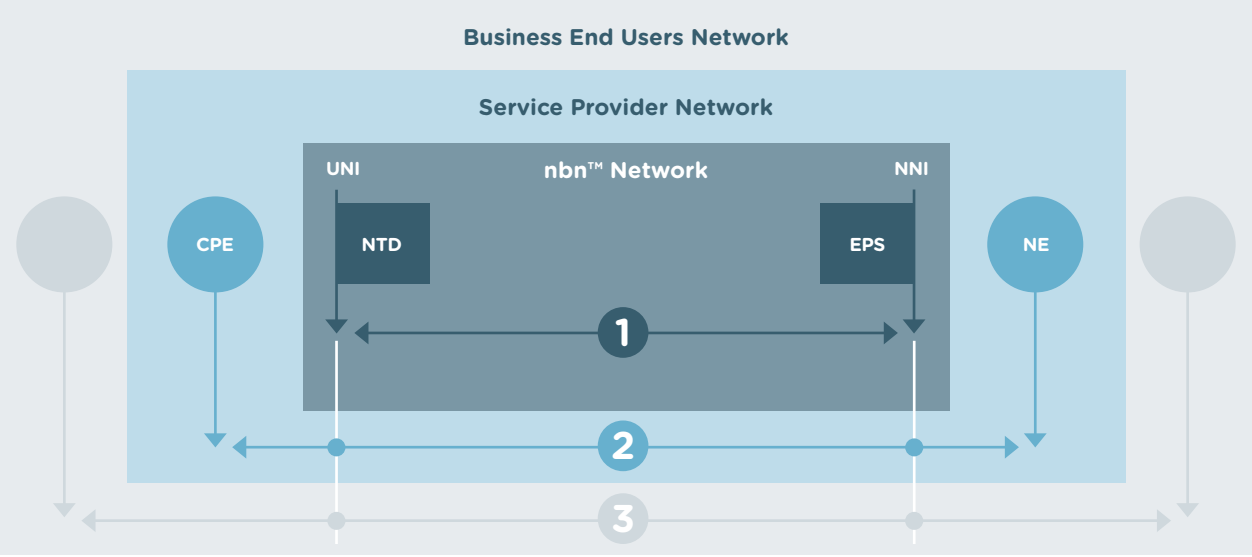
[10] The Performance testing capability for fibre-based FTTN/B is planned to be made available to Service Providers by June 2016, with the details and timing to be confirmed in the next release of the Integrated Product Roadmap

With the introduction of a proposed network demarcation point between the Service Provider and **nbn**'s infrastructure, a Service Provider's operational groups will be able to monitor and manage the **nbn**™ infrastructure as another element in their network. **nbn** has implemented an OAM framework in alignment with industry standards, which it plans to further enhance through offering visibility of **nbn**™ service boundaries at the Service Provider and Business End User level. The diagram below illustrates the monitoring architecture that is available to Service Providers.

Using the **nbn**™ network to deliver fibre access, the Service Provider will have monitoring visibility (as per diagram below) of services at a range of points throughout the **nbn**™ network including:

- Point of ingress to the **nbn**™ network via the regional broadband network
- The Access node
- The **nbn**™ NTD (in the case of fibre-based FTTP)

nbn diagnostic capabilities



▼ Diagnostic End Point
● Diagnostic Intermediate Visibility Point

1. **nbn** has the ability to perform full diagnoses and monitoring within its network boundaries
2. Service Providers have the ability to perform end-to-end diagnostics and monitoring, with visibility of **nbn**'s service boundaries
3. Business end-users have the option of performing end-to-end testing across **nbn** services, with the option of visibility of **nbn** service boundaries

The advanced reporting capabilities available on **nbn**'s NEBS fibre services will provide the Service Provider with Internal Reporting capability comparable to current capability. The ability to partition monitoring between **nbn**-provided and Service Provider-delivered services will enable more accurate root cause analysis of faults, improving the efficiency of fault management and enabling the delivery of a more consistent user experience for Business End Users.

nbn Service Levels

Service Installations

nbn's service installation targets for NEBS fibre are between 9 and 19 days, depending on service location and available infrastructure.

The following are **nbn**'s End User connection service levels (install target in days).

Service offering	Geographical Area	Urban Area (days)	Rural Area (days)	Remote Area (days)
NEBS-FTTP	Service Class 1	14	19	19
	Service Class 2	9	14	19
	Service Class 3	1	1	19
NEBS-FTTN/B	Service Class 10	N/A	N/A	N/A
	Service Class 11[11]	14	19	N/A
	Service Class 12	9	N/A	N/A
	Service Class 13	1	N/A	N/A

End User Service Fault Rectification[12]

nbn has introduced a suite of standard and enhanced service levels for assurance as desired by Small and Medium Business End Users.

The following are the standard assurance service level options for NEBS fibre:

Location of Premises	Service Levels		
	End User Fault Response (hours)	End User Fault Rectification	
		nbn FTTP Network	nbn FTTN/B Network
Urban Area And other locations where End User fault does not require external or internal plant work or **nbn** attendance	1	3:00pm next Business Day	5:00pm next Business Day
Major Rural Area or **Minor Rural Area**	1	1:00pm second Business Day	5:00pm second Business Day
Remote Area	1	11:00am third Business Day	5:00pm third Business Day

[11] Service Class 11 is not applicable to fibre-based FTTB.

[12] For full End User Service Fault Rectification details please refer to the Service Level Schedule section of the WBA: http://www.nbnco.com.au/sell-nbn-services/supply-agreements/wba2.html

A range of enhanced assurance service level options are also available for NEBS fibre:[13]

Location of Premises	Service Levels for Enhanced Fault rectification	
	Enhanced-8 & Enhanced-8 (24/7)	**Enhanced-12 & Enhanced-12 (24/7)**
	Service level (hours)[14]	
Urban Area And other locations where End User fault does not require external or internal plant work or **nbn** attendance	8	12
Major Rural Area and **Minor Rural Area** Where the fault requires external or internal plant work or **nbn** attendance at the premises	22	26
Remote Area Where the fault requires external or internal plant work or **nbn** attenance at the premises	36	40

Where **nbn** does not achieve an Enhanced Fault rectification service level as specified above, **nbn** will provide the Service Provider with an Enhanced Fault Rectification rebate.[15]

For the TSS product classes of Ethernet-Lite and Wholesale BDSL, **nbn** satisfies the default service level for assurance requirements with the availability of the Enhanced-12 service level. In addition **nbn** currently offers a further three Enhanced Service Levels for assurance including: Enhanced-12 (24/7), Enhanced-8 and Enhanced-8 (24/7). Further Enhanced Service Levels for assurance including 6 and 4 hour variants are planned to be delivered by June 2016, as per the Integrated Product Roadmap, published on **nbn**'s website.[16]

Network Availability Targets

The **nbn™** network availability is a performance objective of 99.90%[17] across all current access technologies.

[13] For full details on Service Levels for Enhanced Fault rectification please refer to the Service Level Schedule section of the WBA. http://www.nbnco.com.au/sell-nbn-services/supply-agreements/wba2.html

[14] The Service Levels are calculated by reference to the Operational Hours that apply to the relevant Enhanced Fault Rectification Service option. Part E of the Service Level Schedule section of the WBA explains how Operational Hours are calculated.

[15] For full details of the rebates and structure please refer to the Service Level schedule of the WBA.

[16] http://www.nbnco.com.au/content/dam/nbnco/documents/Integrated-Product-Roadmap.pdf

[17] For full details on the Network Availability target and its calculation methodology please refer to the Service Level Schedule section of the WBA. http://www.nbnco.com.au/sell-nbn-services/supply-agreements/wba2.html

Conclusion

nbn's Traffic Class 2 features and suite of enhanced service levels for assurance provide a clear migration path for the Ethernet-Lite and Wholesale BDSL TSS classes from exchange-fed copper-based SHDSL to the fibre-based **nbn**™ Ethernet Bitstream Service (NEBS).

These features and capabilities provide Service Providers with the ability to provide simple, converged solutions that satisfy a migration from legacy products to **nbn**'s solution, and also provide a variety of enhanced service levels for assurance and network feature capabilities that meet the needs and requirements of Business End Users.

Notes: Terms used but not defined in this White Paper have the meaning given in **nbn**'s Wholesale Broadband Agreement, which is publicly available on **nbn**'s website, or the Subscriber Agreement between **nbn** and Telstra which is confidential.

Appendix: Comparison Table

Considered Area of Product Equivalence	Ethernet-Lite and Wholesale BDSL	nbn's Product Capability
Network Architecture and Product Capability	VC based, connection orientated packet switching network	✓
	Virtual Circuit hand-off models	✓
	Available transmissions rates	✓
	Head end handoffs	✓
	Maximum Frame Size	✓
	UNI Operating modes	✓
	Contention Management	✓
	Network Security	✓
Performance Metrics	Performance Targets	✓
Reporting Capability	Reporting on End User service performance	✓
Network Availability	99.8%	✓
Service Levels for Assurance	Extended Business Hours (default)	✓
Service Levels for Activation	Existing cabling on premises: 15 days IPVPN Connection: 20 days	✓
Commercials and Pricing	Price point per service	✓

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Disclaimer: This document provides general information about the technical requirements for connecting to the **nbn**™ network and is correct as at August 2015. Technical connection requirements may change due to factors such as legislative and regulatory requirements as well as advances in technologies. For any queries about your particular circumstances or requirements, please consult your phone and internet provider or other supplier.