nbn™ BUSINESS

Temporary Special Services White Paper

Megalink and Wholesale Transmission

Contents

nbn™ provides product capability to enable the industry to develop solutions for the migration of copper-based Megalink and Wholesale Transmission (CRA163) domestic transmission capacity services (TWT) to the national broadband network.

nbn provides key product capabilities suitable to support the migration pathway for exchange-fed copper services including Telstra's retail Megalink and Wholesale Transmission (CRA163) domestic transmission capacity services (TWT) to the **nbn**™ Ethernet Bitstream Service (NEBS).

NEBS can help the industry standardise the provisioning and management of their access infrastructure around solutions comprised of the fibre-based access technologies of Fibre to the Premises (FTTP), Fibre to the Node (FTTN) and Fibre to the Building (FTTB). It also offers a range of Enhanced Service Levels facilitating assurance support to businesses and other End Users.

The purpose of this White Paper is to outline how **nbn**'s product capabilities for the fibre-based access technologies of FTTP, FTTN and FTTB can enable the industry to develop business packages and bundles that are the same as, or better than their legacy copper-based equivalents in the Temporary Special Services (TSS) product classes of Megalink and TWT.

Temporary Special Services 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. This White Paper is aimed at the two TSS product classes of Megalink and TWT.

This forms part of a series of White Papers to illustrate the capability of the **nbn** as a suitable migration pathway for TSS. For the full schedule of White Papers, please refer to the Integrated Product Roadmap on **nbn**'s website[2]. This is a White Paper published by **nbn** in accordance with the Subscriber Agreement between **nbn** and Telstra.

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[1] 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

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

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

nbn's Traffic Class 2 capability provides Service Providers and their End Users with performance objectives covering bandwidth, delay, jitter and packet loss:[3]

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

TC-2 is engineered 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 fibre-based NEBS[4] service may be configured to use TC-2 by selecting a bandwidth rate from a flexible menu of standardised profiles.[5] 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 four product components, including two key logical components that are dimensioned by the Service Provider to deliver the value proposition required to secure their target market.

[3] Note: 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. All performance metrics described in this paper are subject to the service provider selecting appropriate features of NEBS, dimensioning services appropriately and complying with **nbn**'s Fair Use Policy. All performance metrics are subject to exclusions such as End User equipment configuration and management of application usage. See **nbn**'s Wholesale Broadband Agreement on the **nbn**™ website for a full list of these qualifications.
[4] Fibre-based NEBS refers to Fibre to the Premise (FTTP), Fibre to the Node (FTTN) and/or Fibre to the Building (FTTB)
[5] Some bandwidth rates are only available for NEBS supplied using FTTP.

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 End User's premises. Traffic crossing the AVC is structured to identify the End User and moves securely through the NEBS infrastructure between the Service Provider's connection to the POI/NNI on one side and the UNI which serves the Premises on the other. For FTTP, the location of the UNI port is found on the **nbn** provided NTD, for FTTB (and FTTN delivered to a multi-dwelling unit) the customer side of the MDF or for FTTN (to a single dwelling unit) through the telecommunications outlet. This gives the Service Provider a high degree of control and management over many aspects of service configuration and performance. When **nbn** terminates NEBS 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 is 1,992 bytes for default-mapped or DSCP or 1,996 bytes for Priority-Tagged and Tagged modes. For fibre-based FTTN/B, the maximum size of an Ethernet frame at the UNI-DSL is 1,592 bytes (for Default-Mapped and DSCP) and 1,596 bytes (for Priority Tagged and Tagged). This is from the destination MAC Address to Frame Check Sequence (FCS) inclusive, which matches standard Ethernet behavior.

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 up to 40 Mbps (planned to soon be up to 100 Mbps) on fibre-based FTTP, can be used to construct retail services that match or exceed the upper end of speeds which many DSL- based retail Ethernet services available in the Australian market today could achieve. **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 fibre- based NEBS 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 1,600 bytes from destination MAC to FCS (inclusive), which matches standard Ethernet behaviour for double- tagged (802.1ad) frames. from destination MAC to FCS (inclusive), which matches standard Ethernet behaviour for double-tagged (802.1ad) frames.

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	100, 150, 200, 250, 300 to 10,000 Mbps (in 100 Mbps increments).	✔

Contention Management

The NEBS interconnection architecture allows each Service Provider to use the aggregating CVC into a serving area to directly influence its End Users' traffic experience. **nbn** does not prescribe the AVC bandwidth ratios applied to a CVC for fibre-based NEBS, 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 some 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 exchange-fed copper services available in Australia today. Service Providers 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 is designed to allow the Service Provider and/or 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 (available for the UNI if Tagged or Priority Tagged mode is selected). By using this field in supported modes, 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 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 and CPE

For both Megalink and TWT, Telstra provides a 'service interface device' as part of the service. The service interface device presents a G.703 user-to-network interface (UNI) to the End-User CPE equipment.

The migration of Megalink and TWT to NEBS-FTTP would see **nbn** supply an internal NTD, unless **nbn** determines that an external NTD is preferable in the circumstances. The use of an external NTD may also apply if an End User indicates a preference for an external NTD during installation and agrees to any additional charges that may apply.

The NTD has the following UNI ports:

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

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

For services delivered using FTTN/B, the access tails are delivered over copper, as is today's practice with the existing, Megalink and TWT offerings.

The location of the UNI is found for FTTB (and FTTN delivered to a multi-dwelling unit) on the customer side of the MDF or for FTTN (to a single dwelling unit) through the telecommunications outlet.

Unlike the FTTP service, with FTTN/B, the Service Provider needs to provide 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**.

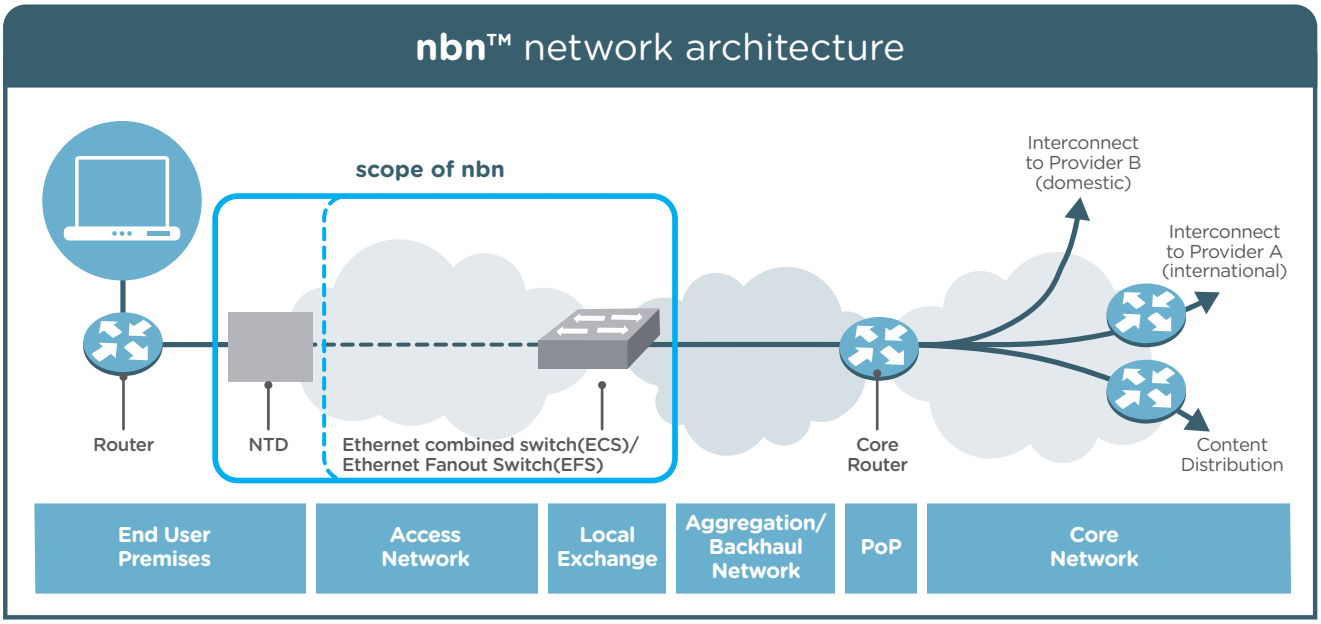
nbn maintains a specification of the VDSL2 modem specifications to interface with the **nbn** network, addressing DSLAM chipset/firmware, DSL and OAM Features, and Performance Requirements.

If the Retail Service Provider (Telstra or Telstra Wholesale Customer) intends to continue to deliver Megalink or TWT services, the migration will require the deployment of an additional suitable E1-over-packet multiplexing CPE at each site. The E1-over-packet CPE may supply G.703 or another capable serial interface as determined by the Service Provider, or as required by the End User.

Simplified Network Architecture without Major End-User Change

Each variant of **nbn**'s fibre-based NEBS solution will either modify or replace the existing access provided as part of a current Megalink/TWT 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 standardise changes at the End User's premises.

The diagram below shows an illustrative comparison of the scope of the **nbn** access replacement within a standardised broadband network architecture.



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

- The provision of an **nbn**-supplied NTD for FTTP or a Service Provider-/ End User-supplied VDSL2 modem for FTTN/B
- The existing copper access service will be replaced with fibre for FTTP or modified by **nbn** for FTTN/B
- DSLAM infrastructure is not required for FTTP and is provided by **nbn** for FTTN/B

Given the ubiquity of IP for today's data applications and networks, the Service Provider and End User may take this opportunity to adopt replicate industry trends and move entirely to a contemporary IP/Ethernet architecture, forgoing E1-based time-division multiplexing (TDM) carriage in the process.

If E1-compliant carriage is still required, the Service Provider and/or End User may elect to reproduce E1-based Megalink or TWT functionality using one of two options:

1. Employ an end-to-end substitution approach that involves the placement of specialised E1-over-packet equipment at each End User premise. These devices would provide E1-related features such as clocking and bit synchronization over an Ethernet transport, including the portion travelling via NEBS. The central PDH/SDH network would be bypassed, possibly allowing the retirement of legacy equipment;
2. Employ a single-end substitution approach that involves the placement of specialised E1-over-packet equipment at one End User premise and another closer the local E1 access node in the exchange.

Whichever option is selected, the TC-2 traffic class can be ordered in bandwidth profiles which include enough capacity for a full Megalink or TWT service (in fact, several of them in some cases) over a single NEBS link, provided the Service Provider and End User configure the NEBS link and services running over it appropriately, for example by scaling the class subscription with sufficient bandwidth, and correctly managing the consumption and Quality of Service (QoS) treatment of other applications.

The result is a simplified access network for the Service Provider, with a standardised Ethernet access virtual circuit terminating on the UNI used to serve the End User's premises.

Commercial Advantage

For a Service Provider, **nbn**'s TC-2 AVC and CVC product components and Enhanced Service Levels for assurance would be considered cost inputs into an end-to-end solution offered to an End User e.g. **nbn**'s TC-2 product components 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 an End User solution.

Industry standards

The NBN NEBS-FTTP and NEBS-FTTN/B services present standard Ethernet interfaces. Other interfaces and PDH functionality supplied with the Megalink and TWT products, such as G.703 are not available from NEBS. Where a customer or End User require interfaces or functionality that comply with these standards, they will need to deploy suitable CPE.

Network Demarcation

A migration of Megalink and TWT services to NEBS will replace the existing copper access element of the services from the End User premises through to the Customer's local Transmission Access Node. This therefore introduces two new Network Demarcation points for the Customer within their network, depending on the NEBS access technology. Namely:

- For FTTP – The UNI at the End User premises and the **nbn** NNI at the POI.
- For FTTN/B – the UNI used to serve the End User site, and the **nbn** NNI at the POI.

For the End User, these changes in Network Demarcation points would be transparent to their replicated Megalink or TWT service.

Sophisticated Customer Reporting, Monitoring and Diagnostics Tools

There are no customer reporting or monitoring tools for the Megalink or TWT offerings.

Given this, **nbn**'s existing capability provides Service Providers with monitoring capability that is better than the capability available for Megalink and TWT today.

The 2015 launch of the Customer Operational Reporting platform provides the Service Provider with visibility of the underlying performance of **nbn** services that can be used as an input to support existing Customer Reporting services. Some capability may however need to be modified to meet Service Provider Megalink and TWT requirements.

Customer Reporting

A key element of the migration of 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. Access via the B2B interface
2. An online, browser-based graphical management dashboard
3. Standardised reports with regular delivery timeframes, including 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 Test[6] (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 Tests[7] (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)	✔

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

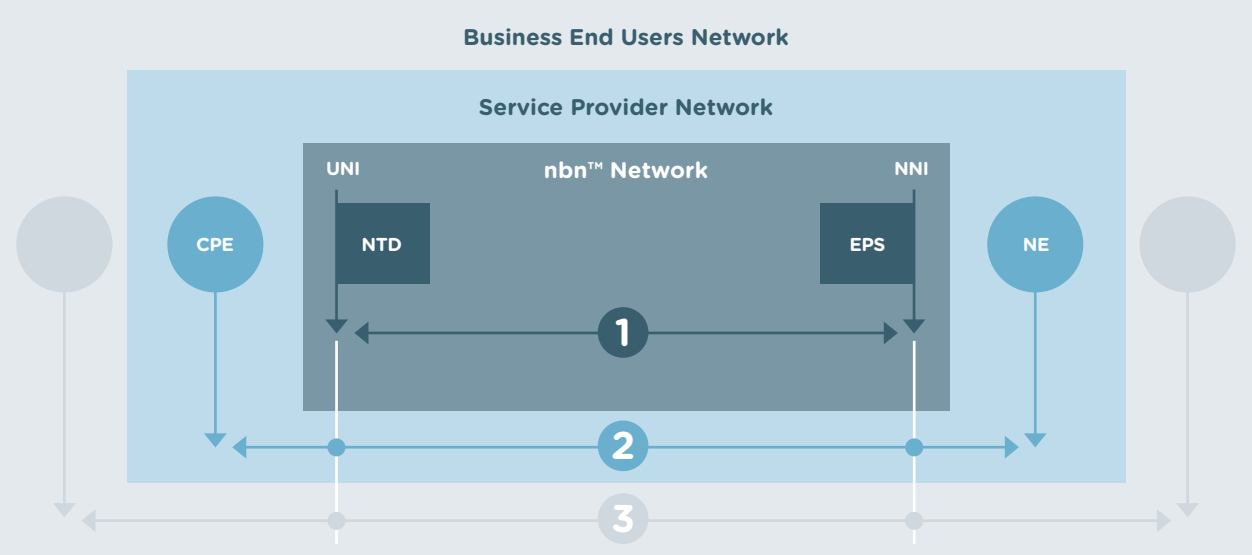
[7] The Performance testing capability for fibre-based FTTN/B is planned to be made available to Service Providers by 1H 2017, as per Integrated Product Roadmap. http://www.nbnco.com.au/content/dam/nbnco/documents/Integrated-Product-Roadmap.pdf

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.

Service Level

Network availability

The **nbn** network availability target is a performance objective of 99.90%[8] across all current access technologies. There is no stated target network availability for Megalink or TWT.

Service Installations

nbn's service installation targets specified in its arrangements with service providers for fibre-based NEBS are between 1 and 19 business days, depending on service location and available infrastructure.

The following are **nbn**'s End User connection service levels (install target in business days). All of these service levels are subject to conditions and exceptions set out in **nbn**'s Wholesale Broadband Agreement with Service Providers.

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	1
NEBS-FTTN/B	Service Class 10	N/A	N/A	N/A
	Service Class 11[9]	14	19	19
	Service Class 12	9	14	19
	Service Class 13	1	1	1

Telstra currently offers **service installation targets** of 9 days for Megalinks or TWT connections in metro areas where no external work is required. For connections requiring external transmission plant work or third parties consent, Telstra's targets are 19 or 24 days for metro areas. For non-metro areas targets are 19 days, 39 days or not specified.

nbn's service targets of 9 business days for urban areas (for FTTP Service Class 2 location) to 19 business days in some rural/remote locations are the same as or better than Telstra's service installation targets.

[8] For full details on the Network Availability target and is 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

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

End User Service Fault Rectification[10]

nbn has introduced a suite of standard and enhanced service levels for assurance which are expected to be of particular use with respect to small and medium business End Users.

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

Location of Premises	Service Levels (business hours)		
	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

A range of enhanced assurance service level options are also available for fibre-based NEBS[11]:

Location of Premises	Service Levels for Enhanced Fault rectification	
	Enhanced-8 & Enhanced-8 (24/7)	Enhanced-12 & Enhanced-12 (24/7)
	Service level (hours)*[12]	
Urban Area or where the fault does not require external or internal plant work or **nbn** attendance at the premises.	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** attendance at the premises	36	40

[10] 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

[11] 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

[12] 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.

For both the Retail (Megalink) and Wholesale (TWT) offerings, **NBN**'s existing Standard and Enhanced Service level offerings can deliver equivalence to the current Telstra options available, other than Express 2 and Express 4 (four and two hour restoration Service Level offerings).

Further Enhanced Service Levels for assurance including 6 and 4 hour variants are planned to be delivered by Q3 2016, as per the Integrated Product Roadmap, published on **nbn**'s website[13].

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

Conclusion

nbn's Traffic Class 2 technical features and suite of enhanced service levels for assurance provide a solid migration path for the Megalink and TWT customers from exchange-fed copper-based access services 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 level targets for assurance and network feature capabilities that can be used by service providers to meet the needs and requirements of End Users.

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

Appendix - Comparison Table

Considered Area of Product Equivalence	Feature or Function	Telstra Megalink/TWT	nbn's Product Capability
Network Architecture And Product Capability	Dedicated copper E1 line from network access node to NTU	✓	N/A
	Native VC-based, connection orientated packet switching network	N/A	✓
	Native PDH/SDH-based, circuit switching network	✓	N/A
	Virtual Circuit hand-off models	N/A	✓
	Available transmissions rates	✓	✓
	Multi-service upper-layer protocols, including IP	✓	✓
	Head end handoffs	✓	✓
	Maximum Frame Size	N/A	✓
	UNI Operating modes	N/A	✓
	Contention Management	N/A	✓
	Security against opportunistic eavesdropping	✓	✓
Performance Metrics	Performance Targets	✓	✓
Reporting Capability	Reporting on End User service performance	✓	✓
Network Availability	High Availability Targets	N/A	✓
Service Levels for Assurance	Business Plus	✓	✓
Service Levels for Activation	Service Installation Targets	✓	✓
Commercials & Pricing	Price point per service	✓	✓

May 2016

nbn Temporary Special Services White Paper – Megalink / TWT NBN3700_Report_0516

Disclaimer: This document provides general information about the technical requirements for connecting to the **nbn™** network and is correct as at May 2016. 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.