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Temporary Special Services White Paper

Ethernet Lite FTTC Executive Summary

nbn’s Traffic Class 2 over **nbn**™ Ethernet (FTTC) provides a suitable migration pathway for SHDSL-based services including Telstra’s Retail offering “Ethernet-Lite” and Telstra’s Wholesale equivalent “Wholesale BDSL” to the **nbn**™ broadband access network.

nbn provides key product capabilities suitable to support the migration pathway for exchange-fed copper services including Telstra's Ethernet Lite and Wholesale BDSL service offerings to **nbn**™ Ethernet.

The purpose of this White Paper is to outline how **nbn**'s product capabilities, called **nbn**™ Ethernet (FTTC), can enable development of 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 Ethernet Lite and Wholesale BDSL services within the meaning of the Subscriber Agreement between **nbn** and Telstra.

TSS are a set of telecommunication products delivered on copper, primarily targeted at the business market. The complete list of more than twenty Telstra Retail and Wholesale Special Services is available on **nbn**'s website[1]. This White Paper is aimed at the TSS product class of Ethernet Lite and Wholesale BDSL[2].

This forms part of a series of White Papers to illustrate the capability of the **nbn** as a suitable migration pathway for TSS. This is a White Paper published by **nbn** in accordance with the Subscriber Agreement between **nbn** and Telstra.

1. **https://www.nbnco.com.au/business/special-services/affected-special-services**
2. Specifically, the SS Class described as "Ethernet Lite BDSL – C" and "Wholesale Business DSL (W-BDSL) – C" in Tables 1 and 2 in clause 1 of Schedule 4 of the Telstra Migration Plan.

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 targets covering bandwidth, delay, jitter and packet loss[3].

Traffic Class	TC-2
nbn™ access network	**nbn**™ Ethernet (FTTC)
Frame Delay (one-way)	≤ 25ms
Frame Delay Variation	≤ 16ms
Frame Loss	≤ 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 **nbn**™ Ethernet (FTTC) service may be configured to use TC-2 by selecting a bandwidth rate from a flexible menu of standardised profiles.

TC-2 provides a committed level of premium capacity with limited ability to burst above its CIR, suitable for applications that require deterministic performance and are likely to be sensitive to Frame Delay Variation (FDV/ jitter) and Frame Loss (FLR).

The **nbn**™ Ethernet product is built of four product components, including two key logical components that are dimensioned by the Service Provider to deliver the value proposition desired for their target market.

3. Note: Some minimum speeds, features and capabilities may not be available for **nbn**™ Ethernet (FTTC) 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 the **nbn**™ Ethernet (FTTC) product, dimensioning services appropriately and complying with the **nbn**™ Ethernet 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.

What is an AVC?

The **nbn**™ Ethernet Access Virtual Circuit (AVC) provides a direct, one-to-one connection at layer-2 between the Service Provider's connection to the POI/NNI and its End User's premises. Traffic crossing the AVC is structured to identify the End User and moves securely through the **nbn**™ infrastructure between the Service Provider's connection to the POI/NNI on one side and the UNI-D which serves the Premises on the other. For **nbn**™ Ethernet (FTTC), the location of the UNI-D port is an Ethernet interface found on the **nbn**-supplied FTTC-NCD. This gives the Service Provider a high degree of control and management over many aspects of service configuration and performance. For **nbn**™ Ethernet (FTTC), the maximum size of an Ethernet frame at the UNI-D is 1,980 bytes (for Default-Mapped and DSCP-Mapped) and 1,984 bytes (for Priority Tagged and Tagged). This value covers the frame from the Destination MAC Address to Frame Check Sequence (FCS) inclusive and reflects standard Ethernet behaviour.

AVC bandwidth options

nbn™ Ethernet 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, a Service Provider 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[4] on **nbn**™ Ethernet (FTTC) can be used to construct retail services that match or exceed the speeds which many DSL-based retail Ethernet services available in the Australian market today could achieve. **nbn** also provides different Tag Protocol Identifier (TPID) formats for the Traffic Class 2 AVCs at the UNI, including Default-Mapped, DSCP-Mapped, Priority-Tagged and Tagged options.

4. Not all premises will be able to support TC-2 20Mbps. For example premises unable to obtain a 20Mbps committed information rate service prior to migration to the **nbn**™ network are likely to have copper connections that only support lower speeds. A service qualification is required prior to ordering.

What is a CVC?

The **nbn**™ Ethernet 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 **nbn**™ Ethernet Product access technologies (other than satellite). The maximum Ethernet frame size at the POI/NNI depends on the UNI to which a particular AVC is presented.

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 **nbn**™ Ethernet 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 **nbn**™ Ethernet (FTTC), 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 **nbn**™ Ethernet (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

nbn™ Ethernet 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).

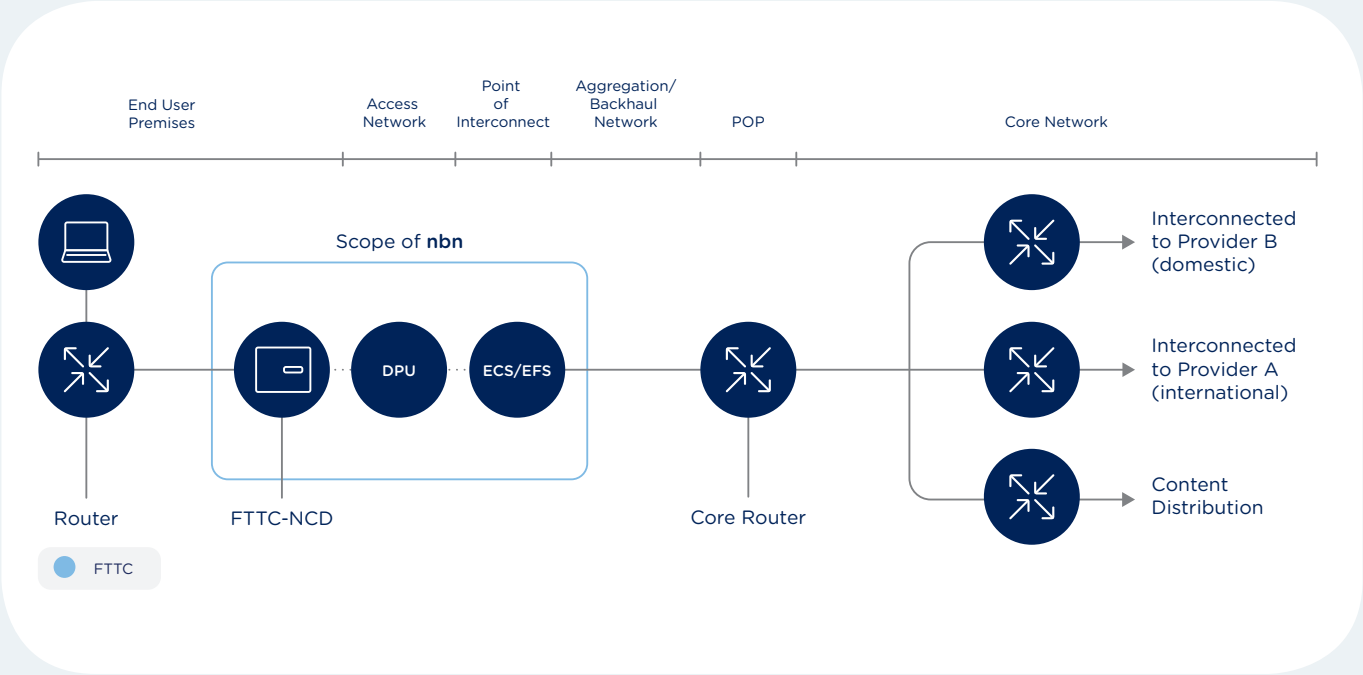
For the purposes of CPE compatibility and/or management simplicity, the Service Provider or End User may prefer to use the IP Precedence/DSCP field in an IP packet, or employ a default class membership for every frame at the UNI. **nbn**™ Ethernet can also support this requirement and **nbn** has published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

Compatible FTTC-NCD and CPE

nbn™ Ethernet (FTTC) provides an FTTC-NCD containing an RJ45-based Ethernet port for connection to Customer Premises Equipment such as a router or switch.

Standardised broadband network architecture

nbn™ Ethernet (FTTC) will modify the existing access provided as part of a current Ethernet Lite or Wholesale Business DSL 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 network replacement within a standardised broadband network architecture.



For the Service Provider, the use of **nbn**™ Ethernet (FTTC) will see the modification, replacement or elimination of certain copper access components:

- The provision of an **nbn**-supplied FTTC-NCD
- The existing copper access will be modified by **nbn**
- DPU infrastructure is provided by **nbn**.

The result is the following network for the Service Provider:

- One end of the service terminates at the physical Ethernet port (UNI-D) on the FTTC-NCD into which the End User's CPE may be connected; and
- The other end of the service terminates at the Network-Network Interface (NNI) at one of **nbn**'s Points of Interconnection.

Commercial advantage

nbn's product prices must be considered simply as a cost input into an end-to-end solution offered by a Service Provider (e.g. **nbn**™ TC-2 product components will be one of the many costs and input parameters in the end-to-end solution).

nbn's product provides attractive capabilities and commercial pricing for Service Providers to deliver an end-to-end solution.

Industry standards

Given that Telstra's Ethernet Lite/BDSL copper-based Ethernet services do not meet MEF compliance, the migration to **nbn**™ Ethernet will have no impact in respect of MEF compliance.

The **nbn**™ Ethernet infrastructure, while potentially being compliant with MEF standards, does not have formal certification. Any achievement of the official MEF certification will be highlighted on the **NBN** Co product roadmap.

Network demarcation

nbn™ Ethernet (FTTC) need not require any functional change to the demarcation points for the End User, who will still be presented with an Ethernet port through which Customer Premises Equipment can be installed.

The migration to **nbn**™ Ethernet (FTTC) 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.

Service levels

Network availability

The **nbn**™ Ethernet network availability target is a performance objective of 99.90%[5].

Service installations

nbn's service installation targets specified in its arrangements with Service Providers are between 1 and 19 business days, depending on service location and available infrastructure. The following are **nbn**'s connection service levels (installation target in business days) for standard installations at an End User premises. These are subject to conditions and exceptions set out in **nbn**'s Wholesale Broadband Agreement with Service Providers.

Traffic Class	Urban area (days)	Major/minor rural (days)	Remote area (days)
nbn™ Ethernet (FTTC) Service Class 31	14	19	19
nbn™ Ethernet (FTTC) Service Class 32	9	14	19
nbn™ Ethernet (FTTC) Service Class 33	9	14	19
nbn™ Ethernet (FTTC) Service Class 34 (FTTC-NCD Shortfall)	9	14	19
nbn™ Ethernet (FTTC) Service Class 34	1	1	1

End User service fault rectifications[6]

The following are **nbn**'s End User fault rectification service levels at an end user premises.

nbn	Standard	nbn™ Enhanced 12	nbn™ Enhanced 8	nbn™ Enhanced 6	nbn™ Enhanced 4
Coverage[7]	Mon-Fri, 8am-5pm	Mon-Sun, 7am-9pm, or optional 24x7	Mon-Sun, 7am-9pm, or optional 24x7	Mon-Sun, 7am-9pm, or optional 24x7	Mon-Sun, 7am-9pm, or optional 24x7
Fix Urban	5pm Next Business Day	12 hours	8 hours	6 hours	4 hours
Fix Rural	5pm 2nd Business Day	26 hours	22 hours	20 hours	18 hours
Fix Remote	5pm 3rd Business Day	40 hours	36 hours	34 hours	32 hours

5. For network availability details please refer to the **nbn**™ Ethernet Service Levels Schedule in the WBA - **https://www.nbnco.com.au/sell-nbn-services/supply-agreements/wba**
6. For full End User Service Fault Rectification details please refer to the **nbn**™ Ethernet Service Levels Schedule in the WBA - **https://www.nbnco.com.au/sell-nbn-services/supply-agreements/wba**
7. For service levels that do not include 24x7 coverage, rectification timeframes are only counted against operational coverage hours.

Conclusion

The **nbn**™ Ethernet (FTTC) technical features and suite of service levels provide a solid migration path for exchange fed copper services including Telstra Ethernet Lite and Wholesale BDSL End Users from exchange-fed copper-based access services to **nbn**™ Ethernet.

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 publicly available on nbn's website, or the Subscriber Agreement between nbn and Telstra which is confidential.

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