NBNCo Limited

Pre-planning and design

Introduction

NBN Co intends to offer Layer 2 bitstream products on an open access wholesale basis in order to create the opportunity for access seekers to sell wholesale services to other Retail Service Providers and retail services directly to consumers.

Points of Interconnect

Following a recommendation in late 2010 by the Australian Competition and Consumer Commission (ACCC), the Federal Government indicated that it expects that NBN Co will ensure that its Points of Interconnect (PoIs) are located in accordance with the 'competition criteria' formulated by the ACCC. There will be 121 PoIs for Access Seekers to connect to the NBN Co wholesale network in order to provide retail services.

A PoI is a location where traffic can be exchanged between one network and another. In the copper based network, local exchanges in each Exchange Service Area (ESA) operate as potential locations for Access Seekers to install their own equipment to provide retail services. Currently, around 550 exchanges operate as service delivery points for Access Seekers.

In the National Broadband Network (NBN) context, copper ESAs will be replaced by Fibre Serving Areas (FSAs). There will be significantly fewer FSAs (700-1,000) than ESAs (5,000). This is driven both by technology differences (greater fibre length for GPON network) and the fact that NBN Co's fibre network will cover 93 percent of premises, which overlays approximately 1,900 of today's ESAs.

Hauling fibre in Brunswick, Victoria, one of the First Release Sites.

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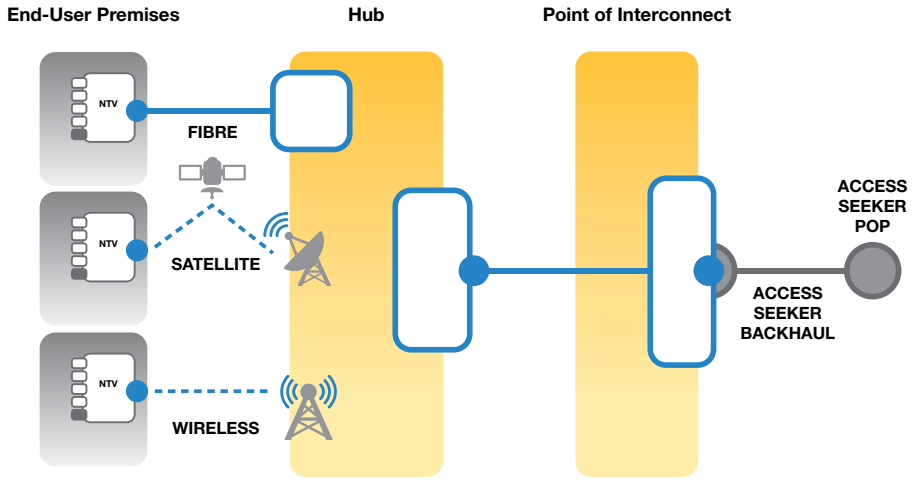
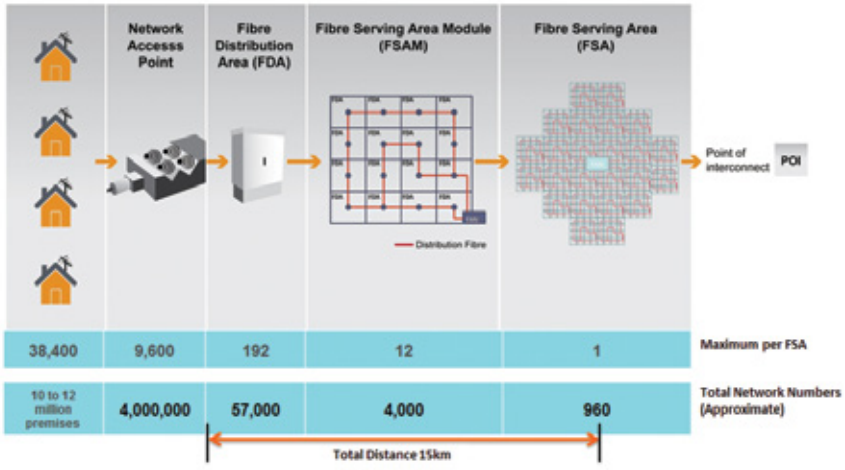
Figure 1 – Pols



Network architecture

The NBN will be built in a 'modular arrangement'. This model as shown in figure below is then effectively replicated across the entire network as seen below.

Figure 2 – Network modular design



Overview of network elements

The figure below provides an illustrative representation of the typical network elements included in the network design. Note final design is still subject to amendment.

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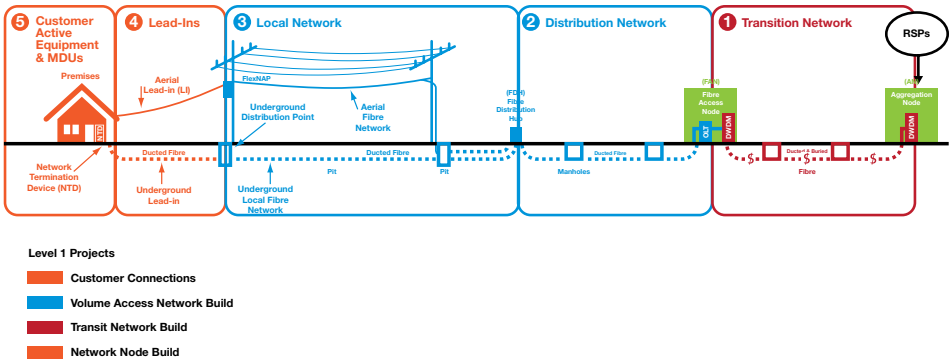
Service Provider backhaul fibre is connected to an Aggregation Node (AN) facility, which connects via the Transit Network to all of the Fibre Access Nodes (FANs) in its Access Aggregation Region.

A FSA is the area that can be serviced by a FAN. Within a FSA there will be a number of Fibre Serving Area Modules (FSAM). For the purpose of an individual FSAM, a summary of the relationship between the various network elements can be described as follows:

- The FAN connects to a series of Fibre Distribution Hubs (FDH) via a network of distribution fibre;
- Each FDH can service up to 200 premises, which are connected to the FDH using a network of local fibre from an internal or external Network Termination Device (NTD) fitted to each premises; and
- For multi dwelling units multiple fibres are provided to a central point on the building. From this point connections to individual units within a building will be completed by fitting the building with internal fibre.

Figure 3 – Physical infrastructure representation



Network elements

Aerial cabling (colocated)

NBN Co will install underground cabling wherever useable existing ducting is located. However, we expect some 25 percent of the NBN fibre to be rolled out above ground (aerial). Where aerial cabling is required, it is planned that the cabling will be strung from existing electricity infrastructure poles. No new poles will be installed by NBN Co as part of the rollout project. The cable is a passive fibre optic cable that does not conduct any form of electrical current or emit any electromagnetic radiation.

The cable is black finish and only slightly larger in diameter than the existing low voltage electricity cable that can be seen in the streets.

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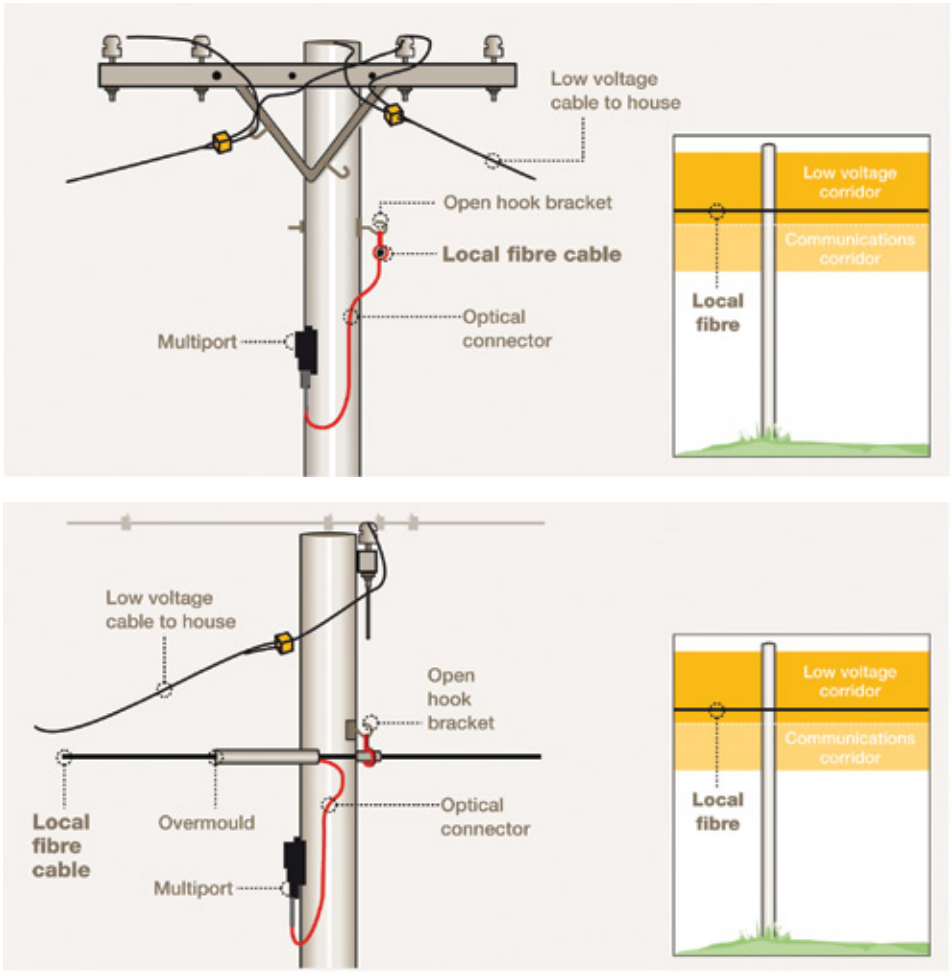
The figure below illustrates a typical connection method for aerial cabling and its location on the pole within the low and high voltage power corridor.

Figure 4 – Location of local optic-fibre connection on existing poles



Hybrid fibre-coaxial

The rollout of Pay TV hybrid fibre-coaxial (HFC) in the mid 1990's occurred throughout Australian mainland capital cities. NBN Co understands that the rollout of the optic fibre network has been compared to the rollout of HFC, which in some areas of Australia was viewed unfavourably.

To avoid confusion with the HFC rollout the following information is provided.

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Network technology services and performance aside, the main differences between HFC and NBN Co fibre network include:

- Cable thickness - the HFC bundle is approximately 100 mm in diameter compared to the NBN Co fibre which is less than 30 mm in diameter (the diameter of the NBN Co fibre will vary according to the technical requirements for the release area however, the fibre will be less in diameter than a HFC bundle);
- The HFC cable requires a metallic support cable called a catenary, while the NBN Co fibre is self-supporting. Additionally, the HFC cable has conductive components while the NBN Co fibre is non-conductive and insulated. This means NBN Co can safely install the fibre closer to the electricity cables in the low and high voltage electricity corridor, to assist in reducing visual impacts; and
- The HFC network requires large pieces of equipment (e.g. a power supply) to be installed adjacent to the poles. It also requires amplifiers to be mounted on the strand. NBN Co fibre only requires a multiport terminal (a multiport terminal is a compact, non-conductive block that will be mounted onto utility poles that will permit the aerial cabling to be attached into the terminal).

Premises connection

The connection to an end-user is achieved with a single fibre drop cable pre-terminated on one end with an environmentally hardened connector installed between the multiport (located in a pit, generally in the footpath near the property) and the end-user premises.

For aerial installation the drop cable will usually be installed in the same manner as the existing AC power services. Underground installation will use a conduit that extends from the pit to the premises.

Depending on the type of installation the drop cable is either connected directly into the NTD or, if the NTD is not installed at the same time, a Premises Connection Device (PCD) will be located on the outside of the premises and the cable left coiled within it.

Where there is a PCD and the NTD is to be installed internally, there will be a fibre cable installed between the internal NTD location and the PCD.

Fibre access node

A FAN is an above ground structure that houses the active equipment to provide services to the FSA.

Due to the size of the building and availability of land for placement the installation of a FAN is likely to be located on existing infrastructure sites such as Telstra exchanges, or within the Telstra exchange.

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Where a FAN facility cannot be located within an existing Telstra exchange a new FAN facility would be required.

The figure below shows a possible FAN facility design.

The FAN facility outlined in the figure would require a land size of approximately 16 metres by 17 metres including a generator and cooling system.

A FAN is capable of servicing up to 36,000 premises, depending on the population density.

Figure 5 – Potential design of a FAN facility

Mix of technologies

The NBN will comprise three major technologies:

- Fibre (approximately 93 percent coverage); and
- Fixed wireless and satellite (approximately seven percent coverage).

Fibre

The bulk of the fibre rollout is expected to be underground utilising Telstra ducts and pits provided agreement can be reached with Telstra. It is hoped that negotiations about this can to be finalised and approved by Telstra shareholders during 2011.

The remainder of the fibre rollout will be achieved via aerial cabling, colocated with existing electricity distribution networks.

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Fixed wireless and satellite

Approximately seven percent of premises will be serviced by a fixed wireless or satellite solution. NBN Co is presently considering options in terms of frequencies and infrastructure.

Fixed wireless

If you receive a fixed wireless service via the NBN, transmission will be provided wirelessly from a wireless base station. NBN Co's wireless solution will not be designed to allow users to continue to use the service while moving from one wireless base station to another (that is, the service will not include inter-cell handoff). It does not mean you will receive services over mobile broadband.

Fixed wireless broadband delivers services to a specific location such as a home or business, rather than to a device that moves from place to place. In contrast, mobile broadband solutions generally deliver services to devices as they move from one base station to another.

Unlike mobile broadband, the NBN Co fixed wireless solution is not impacted by a variable number of users on the network. Fixed wireless networks are engineered to meet the speed and service requirements for a known number of users in the coverage area, which means that the bandwidth per head and speed experienced can be much more consistent and stable, even in peak times of use.

Mobile wireless networks are engineered for a larger number of users who move around. The available bandwidth must be shared between the variable number of users served by a tower at a particular time, which means speeds will vary based on a number of factors, including distance and the number of people using the service at the same time. The result is a less consistent broadband service, especially in times of peak use.

Satellite

NBN Co is planning to launch two 80 gigabits per second next-generation Ka band satellites. The broadband access services available over satellite are designed to provide peak download speeds of 12 megabits per second - similar to those that many city people currently experience. However, the speeds that end-users will experience will depend on a number of factors including the plan they choose, their equipment and their in-premises connection.

NBN Co's next-generation satellites will be purpose-built to provide high speed broadband for the Australian population, and not splitting capacity between a number of other tasks like satellite phones and broadcast television, nor focused on providing services in other countries.

The NBN Co satellites will have multiple focussed high capacity beams that are designed to maximise spectral efficiency. NBN Co will also use currently leading edge

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ground equipment and acceleration techniques to maximise performance.

NBN Co's satellite network will require about 10 gateway sites across Australia, likely to be located in remote areas of WA, SA, VIC and / or NSW to avoid areas of high population density and heavy rainfall in NT, QLD, TAS. Their exact location will be determined by the capability of the vendors' equipment and NBN Co planning and design.

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