Transitioning to the NBN

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Many PCUG (PC Users Group, ACT region, Australia) members have transitioned to the NBN (National Broadband Network) or are shortly to do so. This document is intended to give information to make that transition a smoother, less confusing process.

Business

The NBN was an initiative of the federal Labor government in Australia. The basic idea is that the NBN Company acts as a wholesaler of communications services and various ISPs (Internet Service Providers) provide retail services to customers. The NBN provides the link from the customer to a POP (Point Of Presence). Then the ISPs provide links to the outside world, plus billing and various other services to customers. This is to allow customers to change their ISP easily, thus giving competition between ISPs.

The former monopoly telephone provider, Telstra, becomes just another ISP, competing with all the other ISPs. Contractors hired by the NBN do the physical work of laying cables, etc. from customers to local POP. At the POP, ISPs hire space for equipment and rent customer connections from the NBN. All this is similar to the way TransACT is organised in the ACT region.

The NBN POP for the Canberra region is in or near the Civic telephone exchange.

Customers interact with their own ISP, not NBN. In the event of a dispute between a customer and an ISP, there is the TIO (Telecommunications Industry Ombudsman) and ACMA (Australian Communications and Media Authority).

Technology

For very high speed data links there is really only one technology of importance, optical fibre. However, there are numerous technologies available to get communications data out to consumers:

FTTP – Fibre To The Premises. Gives highest performance. Speed capability is 1000Mbit/s, regardless of the length of the line. Signal interference does not exist. Cost is low. Premises can be businesses, houses, apartments, schools, etc., basically any building. Fibre comes right into the premises, terminating at the FTTP “NBN Connection Box”, then a modem (typically provided by the ISP, see modem section below), then LAN (Local Area Network) cable, Wi-Fi and telephone cable from there.

FTTN – Fibre To The Node. A node is a street cabinet, probably 100s of metres away from the customer, then copper from there. The customer has a modem and cables, as for FTTP. Uses a modulation called VDSL2 (Very-fast Digital Subscriber Line, version 2). There is a line length limitation of about 0.7km. Speed is typically up to around 80Mbit/s, depending on the distance to the node and signal interference in the cable. Many customers get no better than 40Mbit/s, some even worse.

FTTB – Fibre To The Building. Useful for already-built units of apartment buildings. A node cabinet is placed at some convenient place in the building, typically a basement. Fibre comes into the node, then typically 2-pair cables to each unit. Presently, VDSL2 modulation is used on just one pair. Speed capability is typically 80Mbit/s. Then a modem and cables, as for FTTP.

FTTC – Fibre To The Curb. Current speed, cost and modulation is uncertain, due to ongoing technological development. Fibre is brought close to the premises, then copper from there. An FTTC “NBN Connection Device” connects to the phone line. Then modem and cables, as for FTTP. Faster than FTTN, but where to put the many small nodes is a problem.

HFC – Hybrid Fibre Coax. Old pay TV coaxial cables (former Foxtel or Optus). Current speed, cost and modulation is uncertain, due to ongoing technological development. An HFC “NBN Connection Device” replaces the old cable set-top box, then modem and cables.

Fixed wireless – microwave radio. Moderate speed. Useful in low-density country areas. A high tower transmits/receives radio signals to cover an area. Modulation is WiMAX (Worldwide Interoperability for Microwave Access). The best results are obtained when there is line of sight between the tower and the customer's aerial. Cost varies with the size and height of the customer's aerial. Needs an external aerial, fixed wireless NBN Connection Box (transceiver), then router and cables. The aerial is often built into the NBN Connection Box, and mounted outside. Speed can reduce due to multiple customers competing for radio bandwidth.

Satellite – geostationary satellite transponder. Slow. Cost is high. Sky Muster satellites provide broadband to offshore and very remote areas. Needs a satellite dish, satellite NBN Connection Box (transceiver), then router and cables.

Mobile – mobile phone network. Data comes through the various radio technologies used by digital mobile phones. Slow to fast, depending on the technology, distance to the mobile phone tower, interference, congestion and available bandwidth. Cost is always going to be high, due to the complexity and commercial competition for radio bandwidth. A mobile phone can be “tethered” to a computer (or router), to give internet access.

ADSL – Asynchronous Digital Subscriber Line. Slow, now obsolete. An old telephone line goes typically several kilometres to ADSL equipment in the local telephone exchange. The customer has a modem/router and cables.

FTTN, FTTB and FTTC are all ways of drastically shortening an existing telephone line. A landline telephone line consists of a pair of insulated copper wires, gently twisted together, also known as the “local loop”. The laws of physics dictate that shorter lines can carry higher frequencies with less attenuation. Higher frequencies are needed for higher data speeds. There is a trade-off between distance and speed. Shorter is better.

Politics

The original vision of Labor’s NBN was over 90% FTTP, with remote areas served by preferably fixed wireless, then satellite as a last resort. This would have given the vast majority of customers the highest possible speed. The coalition criticised the cost.

The coalition decided to have the Multi Technology Mix (MTM), which added FTTB, FTTC, FTTN and HFC. The NBN Company struggles to this day to cope with the extra complexity. Planning for the majority of existing suburban customers was moved from FTTP to FTTN. This was to avoid having to lay optical fibres to many customers. Cost has not been reduced as much as had been predicted. Time to deliver the NBN has increased.

It is up to NBN Co to decide what technology is available to each customer. It is not unknown that people on one side of a street will have one technology, and people on the other will have a different technology. Customers in new developments get FTTP. It costs about the same to lay new optical fibre cable as new copper cable. Many customers feel it is unfair that they have to put up with an inferior technology when their neighbours have something better. How fast the NBN connection is, affects the value of property.

Modem

The “modem” supplied by an ISP is typically a small box of electronics which contains: a VDSL2 modem (one RJ11 port for input) , a router (with an RJ45 port for WAN input), a network switch with four RJ45 LAN ports, two netphone interfaces (each with an RJ11 phone port), a 2.4Ghz Wi-Fi AP, a 5GHz Wi-Fi AP, a USB port and a small administrative website to control all the various features. This is a lot more than just a modem. RJ11 means a standard small rectangular 6-pin telephone socket; normally only 2 pins get used. RJ45 means an 8-pin network socket; all 8 pins get used; speed is normally 1Gbit/s. WAN means Wide Area Network, the NBN side of the router. AP means Access Point, the place where network data is converted into

Wi-Fi radio signals. LAN means Local Area Network, your local wired network. Usually, computers and printers are connected with network cables, but laptops and tablets are connected using Wi-Fi.

The administrative website can be accessed from any LAN-connected computer with a web browser. It works regardless of whether the connection to the NBN is good or not. It is very handy for troubleshooting, because it tells you the status of everything, plus allows you to change settings. Put a bookmark (or favourite) into your web browser on your main computer, which points to the administrative website. Similarly, things like Wi-Fi APs, printers and NAS boxes often also have little websites built into them. Put in bookmarks for them as well. NAS means Network Attached Storage, a specialised box designed to allow large amounts of storage to be continuously available over your LAN.

Modem means modulator/demodulator. Standard network cables have four pairs and are limited to a length of 100m. Telephone lines have only one pair and can be much longer than 100m. VDSL2 is a way of encoding the data in such a way that it can cope with the deficiencies of a typical telephone line. VDSL2 is much more complex than the simple scheme used on network cables. A VDSL2 modem converts between VDSL2 signals on a telephone line to/from network data.

Notice that for FTTP, FTTC, HFC, fixed wireless and satellite, the VDSL2 modem in the “modem” does not actually get used. NBN data comes into the WAN port instead. The router and the network switch get used. But you decide what other things on the LAN side of the router get used. In this case, calling it a “modem” is a little bit deceptive. Calling it a “router with LAN-side accessories” would be more accurate, but long-winded.

TransACT

Before 2001, Telstra was the monopoly provider of landline telephone lines in the ACT region. TransACT cables were rolled out in the region from about 2001. TransACT mostly did FTTN. Optical fibre goes from TransACT House (the POP, in Dickson) to nodes in suburbs. Copper telephone pairs go from the nodes to customers, via new cables installed by TransACT. This broke Telstra's monopoly on landlines. Modulation is now VDSL2, the same as NBN FTTN. Unfortunately, the FTTN rollout was brought to a halt by the 2003 bushfires. TransACT then had a think about what technology they should be installing. TransACT became owned by iiNet, which is a division of TPG (a public stock company). TransACT continues to own and maintain all that FTTN infrastructure.

In many suburbs, TransACT cables can be seen at the back of the block, between the old Telstra cable and the electricity cables. There are distinctive small nearly-square black connection boxes on the poles. TransACT customer drop cables have four pairs in them, so are bigger than the old one-pair Telstra cables. TransACT nodes are grey metal street cabinets in two sizes, “small node” and “supernode”. A small node is typically mounted on a pole and about w=0.5m d=0.5m h=1m with a sloping top. A supernode is free standing, about w=1.5m d=0.5m h=1.2m with a curved top and fans running.

A TransACT copper pair carries low frequency telephony signals and high frequency VDSL2 signals. A customer's pair terminates at a VDSL central filter – a small grey plastic box. The filter may be under the eaves (near the incoming drop cable), in the roof space or some other place as directed by the customer. The filter is the TransACT boundary. On the customer side of the filter, everything, apart from equipment rented from TransACT, is owned by the customer. From the filter, a telephone pair carrying only low frequencies, goes to the telephones. Telephones are entirely conventional analog landline phones, such as a Touchfone or a cordless phone base station. From the filter, another pair (typically in a network cable) goes to the VDSL2 modem/router and cables.

TransACT plans usually provide a conventional landline phone line, not a netphone. Supernodes, where telephony comes from, have internal backup batteries. If you plug in a phone that still works when there is no

mains power, such as a Touchfone, you have “lifeline telephony”. The phone still works when the power goes out.

TransACT competes directly with the NBN. If you are already on TransACT, you can just stay with them. There is a limited selection of ISPs. If you are considering transitioning to the NBN, walk around your suburb and look for TransACT infrastructure. If you see TransACT FTTN infrastructure or you know independently that there is TransACT infrastructure in your suburb, TransACT FTTN may be better than, NBN FTTN. NBN FTTN is using old cables, TransACT is from around 2002. Newer cables are more accurately made than older cables, which affects the cable's ability to carry high frequencies. Old cables often have “bridge taps” (or “tags”, “T” joints with an unterminated branch), this adversely affects high frequencies. You may get better speed from TransACT compared to NBN.

TransACT did FTTP in some newer suburbs and that infrastructure was subsequently purchased by NBN Co. So if you are in those suburbs you do not need to do anything. You are already on the NBN, with the usual ISPs and plans.

NBN Infrastructure

NBN lays optical fibre from the POP, to FTTP customers and various types of nodes. HFC systems have a place where optical fibre is connected. You can walk around your suburb and see what kind of NBN infrastructure has been installed.

An FTTN node is a big green metal street cabinet, w=1.2m d=0.6m h=1.3m with a flat top and fans running. Nearby you will find a little mains power connection box and the pillar. The pillar is controlled by the NBN Company. TransACT does not have pillars, they do it all inside the nodes – which is more efficient.

Nearby customer pairs come into the pillar and terminate on connection blocks. Multi-pair cables from the local telephone exchange also terminate on other connection blocks. A jumper (one red wire and one white wire) connects a customer pair to an exchange pair. The distance from the customer to the pillar is short, with few connections. However, the distance from the exchange to the pillar is long, through many cables, many connections and many pits. A telephone line fault can usually be fixed by changing the jumper to a spare exchange pair. Sometimes there is no pillar, things might be done in a pit. But, a pit is a pain to work on compared to a pillar.

When the FTTN node was installed, the NBN laid another multi-pair cable to yet more connection blocks in the pillar. Sometimes a pillar runs out of spare space for all the connection blocks, then the NBN adds more on top and installs a new taller cover. But the old pillar is still in there, minus its old cover. Sometimes a node has cables going to multiple pillars.

Transitioning

For FTTN, transitioning a customer to the NBN consists of removing the old jumper in the pillar, and putting in a new jumper from the customer pair to an NBN pair. FTTB needs a node installed by NBN Co. The copper line gets much shorter. The customer plugs in an ISP-approved modem. Other NBN technologies involve an NBN connection box/device, with installation organised by NBN Co. The customer pays their ISP and the ISP pays rent to NBN Co.

ISPs are companies like Optus, Telstra, TPG, iiNet, etc. You can contact the ISP, or visit their website. Then input your address to determine if the NBN is available to you, and what technology (see above) is available. Then you need to select a plan. To do that, you need to know your usage (download+upload), and the speed you require. Of course the cost is an issue. Do not pay for an unlimited plan unless you need one. If you find you need to go to a lower usage plan, the ISP should not charge you a ‘change of plan’ fee.

Then the ‘fun’ may start because everyone’s situation is different. Most ISPs will send you a modem and expect you to connect it yourself. ISPs do not generally provide help, but some deserving customers can get a technician sent out to help. Being a customer of long-standing, or with a physical disability can make you deserving. If you need help, you can phone the ISP's support people. Document any problems as you go.

If you do make a transition to an NBN provider, and it does not work, the fine print in the contract says they must fix it in two weeks or revert you to your original service.

Ultimately, when everybody has transitioned, the old exchange cables will become unused. Then, some exchanges can be sold. Telstra gets a whole lot of money. What mischief might Telstra get up to, with all that money to spend?

Telephony

Many ISPs decline to use the telephony facilities built into the FTTN nodes. They prefer to use a netphone (VoIP, Voice over Internet Protocol) interface built into the modem. This means that the process of digitising the small analog signal from a telephone is done in the netphone interface, not the node. A VDSL filter becomes unnecessary. The telephones work the same.

Disconnect your telephones from the incoming telephone pair. Instead, connect them to the netphone socket on the modem. To keep using your existing telephone wiring inside your premises, you may need help from a technician. Your incoming telephone pair ends up going to one place only, your VDSL2 modem.

Unfortunately, you have lost the lifeline telephony which your old exchange-connected telephone line provided. A telephone exchange has a massive battery which runs the whole exchange, and a diesel backup generator. It is immune to power failure. Provided your old telephone did not need mains power, it would keep on working during a power failure. Most people simply use their mobile phone for lifeline telephony. It may be possible to restore lifeline telephony to your landline by using a battery-backed power supply for your modem, plus an old telephone. It would take a real power failure in your suburb to test this arrangement.

Boundary

You own your premises wiring. Remember the boundary where responsibility passes from your ISP to you. For the NBN, it depends on the technology. The boundary is where “their stuff” ends and “your stuff” begins. No ISP ever wants to troubleshoot your stuff. That is your problem and if you have to hire an independent technician, that is up to you. They will fix their stuff up to the boundary and no further. To avoid misunderstandings when things go wrong, you need to be well aware of where the boundary is.

For example, suppose you are in a large building and you have problems with your FTTN service. The NBN (as requested by your ISP) will test up to the MDF (Main Distribution Frame) and no further. If your problems are actually caused by a fault between the MDF and your telephone socket, that is your problem, not theirs. Hire an independent technician. Not understanding who owns a fault can cause long delays and a lot of upset.

Sometimes, a particularly nice ISP will grant you a technician visit to fix a problem on your premises. That actually happened with the ADSL connection to the PCUG's training room in Holder. TPG kindly gave a visit from a very skilled technician to fix a no-connection problem between the training room and the MDF. The training room network administrator needed to be present to provide access and fix computer settings. Well done TPG, much appreciated. The PCUG has been a loyal customer ever since.

Scams

You may get telephone calls telling you that you must change to NBN or change provider. This is almost always a scam. There is a well-known scam where the call begins, “Hi, this is Nicole from the Australian National Broadband Network ...” Treat all such calls with deep suspicion. For example, if you are on TransACT, you need do nothing.

Bureaucratic Arrogance

Unfortunately, some bureaucrats have decided to invent the term “CSP” meaning “Carriage Service Provider” instead of “ISP”. ISP is well known worldwide. CSP is obscure and little understood. Google and Wikipedia are your friends. When you see CSP, just translate it to ISP. The bureaucrats did this to prove how arrogant and out of touch they are.

They have form. They did the same thing with “IT” and “ICT”. IT means “Information Technology” and encompasses computers and communications. IT is well understood worldwide. ICT means “Information and Communication Technology” and is obscure and redundant.

Unfortunately, some people have to fear the disapproval of bureaucrats, so you will see CSP and ICT popping up in lots of places. Alas.

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