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Submission to the Australian Senate Select Committee on the National Broadband Network

9 March 2010

To: The Commission Secretariat
via email: broadband.sen@aph.gov.au
Attention: Stephen Palethorpe

Thank you the opportunity to make this submission, the subject of which fits within the areas of access obligations and services of the NBN Company.

We have followed closely the evolution of the Australian NBN.
We have worked recently on projects in Australia with Pacific Broadband Networks Pty Ltd, Austar TV, Alcatel-Lucent etc.

I wish to raise here the question of delivery of television broadcasts (terrestrial, cable and satellite) over a fibre optic network.

Most people involved with the NBN and FTTH (fibre to the home) are comfortable with IP (Internet protocol) technology and usually surmise that TV signals will be sent as IPTV packets over the data wavelengths of the fibre optic network.

However as the quality of television images constantly improves (from SD -standard definition, to HD—high definition, to 3D and beyond) the bandwidth required on the data channel grows enormously.

The current NBN project targets delivering a download bandwidth of 100 Mbps to the average household.

Figure 1 shows that very quickly this capacity will be inadequate, mainly due to the demands of transmitting television signals over the data path as IPTV.

Although we are usually impressed when watching 1080p HDTV, there are currently well advanced plans for much higher quality TV transmissions, thus increasing further the bandwidth requirement in the network.

For example NHK in Japan and British Sky Broadcasting in the UK are proposing an ultra-high definition video format that will deliver a resolution of 4000 lines compared to 1080 for HDTV. Currently it requires about 45Mbps per channel to broadcast in 2D. If the broadcast industry is right this time and 3D is here to stay, that will demand even more bandwidth. Multiply that by the number of people in the house watching different programming at the same time, and the supposedly "ultra-fast" fibre connection will quickly be saturated.

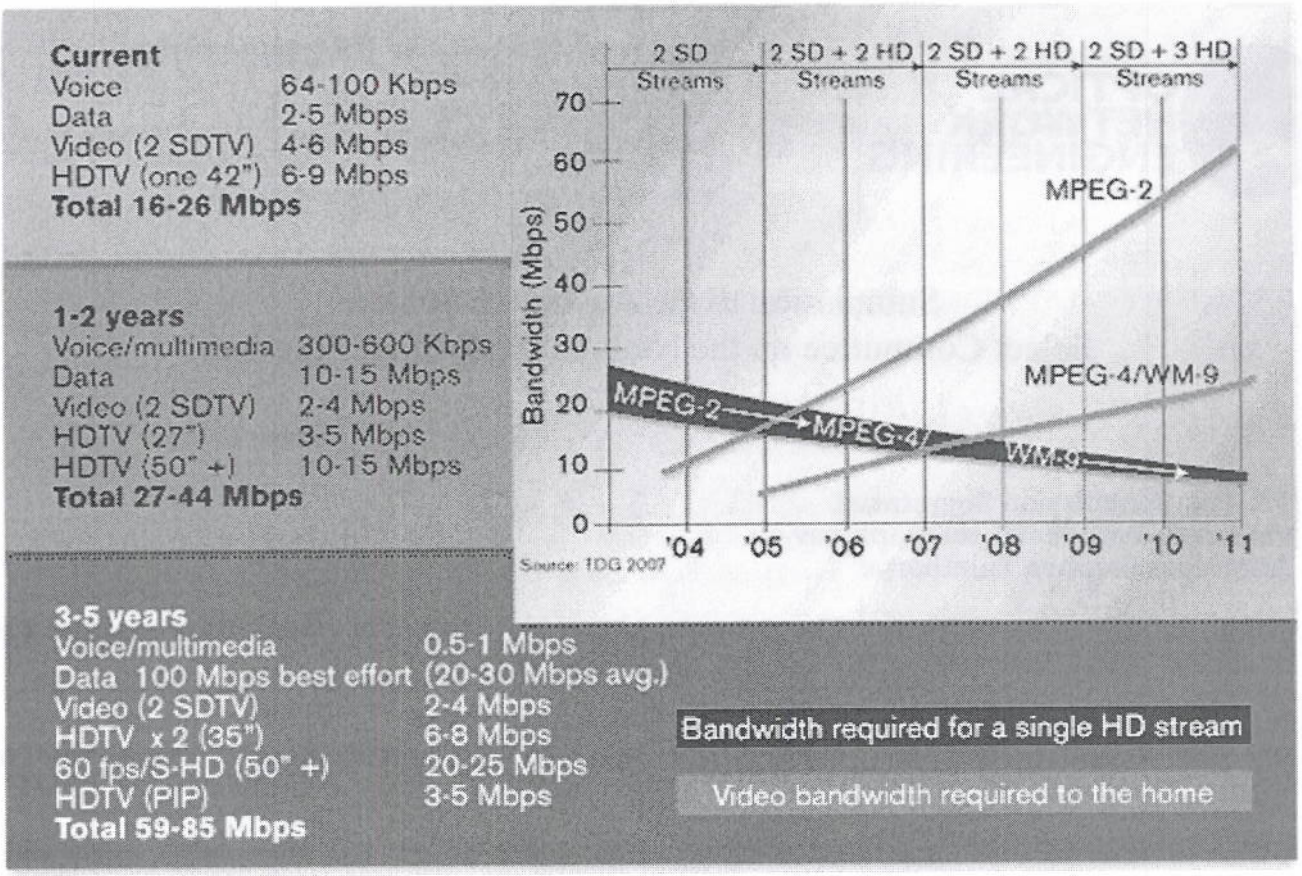

Figure 1—IPTV bandwidth requirements

Why do we need to even talk about transmitting broadcast TV over our fibre network? Just put a TV antenna and a satellite dish on the roof, and the problem is resolved!

However most new housing estates and high-rise apartment buildings' covenants refuse the installation of individual antennas.
Everything goes underground now: power, gas, sewer, water, and of course fibre and TV delivery.

Is there then an alternative solution to IPTV?

Yes, and this leads me to the subject of my submission.

In all of the documentation we have read concerning the NBN, there is almost NO mention of an industry standard FTTH option called **Video or RF Overlay**.

It is perfectly compatible with the functioning of the fibre data channel, and is totally complimentary to the use of IPTV for "on demand" TV services.

The ITU (International Telecommunications Union) has standardised for quite some time now the use of a "third wavelength" on the fibre network specifically for the transmission of TV Broadcast channels.

In a standard FTTH "data only" system, there are two channels on a single fibre: data sent and data received. These channels use two different "colours" or wavelengths of light: 1490 nm wavelength for downstream data and 1310 nm for upstream data.

The amazing thing about fibre optic transmission is that many different "colours" or wavelengths of light may be transmitted over the same single fibre with almost no mutual interference.

So the ITU has recommended a third "colour" (1550 nm) solely for the transmission of broadcast television (this can include digital radio also).

This 1550 nm transmission is what is called the Video or RF overlay.

All existing and even future SD, HD, 3D et al transmissions can easily be accommodated on this third wavelength, thus totally offloading the very important data channel.

Figure 2: What is no longer allowed

Taking all the present and future FTA (free to air) and Pay (cable and satellite) television channels **off** the data channel equates to a saving of up to 7 or 8 Gbps (gigabits per second), a massive amount of bandwidth, which will pay huge benefits as the overall demand for bandwidth inevitably increases.

It means that the data channel can do what it does best: handle voice and data only and not be strangled by huge amounts of television data in the form of IPTV.

IPTV in itself is a very immature and imperfect technology. Neither Australia nor New Zealand are ready, even *able* I suggest to deliver current TV programming over IPTV.

With IPTV the householder's choice of a program is made in the home, goes out to the server, and the requested channel is than streamed over the data channel back to the client.

There are very finite delays between the request for, and the delivery of the channel.

Every TV set in the home must have its own IPTV set top box and data stream, and each IPTV stream adds to the bandwidth required. Three TVs on IPTV equals three times the bandwidth of one.

In Europe experience shows that 90% of viewers watch broadcast channels compared to Video on demand (VOD). Using IPTV, every TV receiver receives a separate data stream of very often the same programs, thus increasing enormously the routing and traffic over the global network.

The IPTV process is managed by what is commonly known as "middleware". There are no real standards in place for this middleware. There are many different proprietary middleware solutions used in various countries.

Middleware vendors of course claim that their product is perfect, but there are very few perfect installations in the world currently.

Telecom New Zealand trialled IPTV for some 3 years and abandoned it for a number of reasons.

Even with a theoretically "perfect" IPTV solution, this does not address the ever-increasing risk of saturating the data fibre channel, and defeating the purpose of high-speed internet.

Taking these facts into consideration, we simply cannot understand why the option of video overlay has not been seriously considered by NBN Co.

Video Overlay: how do you do it, what does it cost?

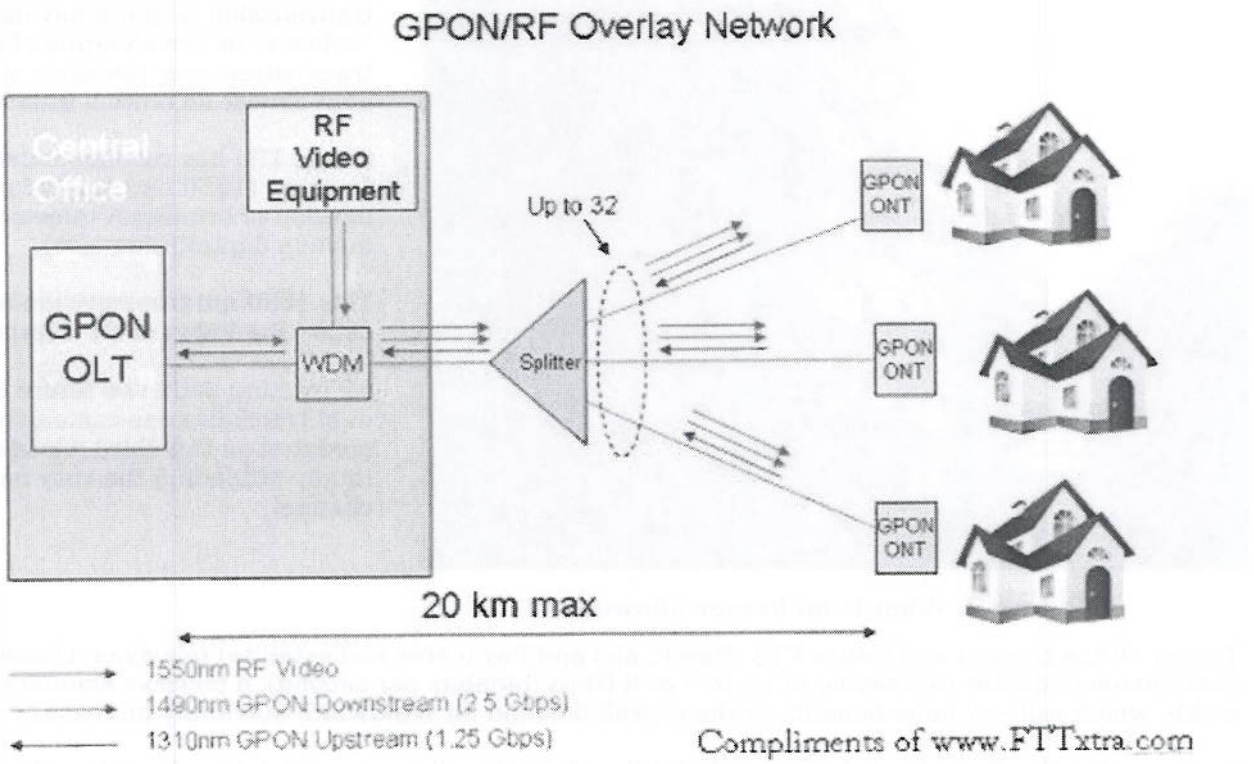

Figure 3: Adding the third wavelength

Figure 3 shows how the third light colour, or wavelength is added to the fibre which initially carries the data channel.

The television signals are thus broadcast over the same fibre on their own ITU standard wavelength. **Broadcast** is the key word, because every single channel is available instantaneously to the homeowner. There are no delays in switching channels, you can have as many different channels on as many different TV receivers in the home as you wish without hogging or slowing down the network.

There is no "middleware" required. It functions exactly as if you had your terrestrial and satellite antennas on your own roof.

What must be stressed here is that there is no need to provide a "nation-wide" TV distribution system. This indeed would be costly and complex.

Every node in the NBN has what is called a "Headend" which currently can serve a radius of around 20 Km. A circle with a radius of 20 km is quite a huge area and can cover many thousands of homes and apartments.

Typically a "Headend" will be located in a very small room or building, something like a small telephone exchange. The Headend can be provided with a single terrestrial UHF TV antenna, a single satellite dish of normal size, a cable TV connection.

The full range of broadcast TV channels is then injected into that area's fibre network.

Cost? Incrementally very little compared to the overall network cost.
Each Headend would require a 1550 nm optical transmitter and amplifier (EDFA), and the simple mixing equipment into the single fibre (WDM or wave division multiplexing). At the home end, a simple filter and small video ONU unit is required. The cost is truly minimal compared to the overall network cost and to the alternative coaxial cable based TV distribution systems.

The television signals are delivered into the home's normal TV distribution cabling system, and into standard TV receivers. No special or extra decoders, or set top boxes are required, only the standard Foxtel or Austar decoders, exactly the same ones that are currently used.

Open network? The NBN network must be open. As far as TV is concerned, this means being able to deliver everybody's TV services concurrently. Except that Foxtel and Austar do not really compete geographically—with one single exception, the Gold Coast.
This means that in most of Australia, there is no need to co-deliver Foxtel and Austar services. The FTA channels are easily accommodated with plenty of space for future expansion.

Fibre is inexpensive. It could be advantageous for the future to run a fibre pair to each home over the last mile (or 20km in FTTH terms).

Thus the full array of TV programming could reside on the second fibre if any sustained criticism of competitiveness was entertained.

Room for everyone? Over the last year, much work has been done to extend the video overlay bandwidth on the 1550 nm wavelength. The old system only accepted up to 850 Mhz, the upper UHF terrestrial TV broadcast limit. We now can use a bandwidth of up to 5.4 Ghz thus allowing multiple L-band QPSK streams from satellite DTH (direct to home) services.

What this means is that there **IS** room for everybody on the one light colour, and no need to convert satellite transmissions down into the old CATV band which engendered conversion to the QAM (quadrature amplitude modulation) scheme, a very expensive exercise that was necessary for the older cable TV networks.

Detractors: Every proposal, however factual and well presented, has its detractors. In this case we have a couple and I briefly note their arguments:

Broadcast Australia: has publicly stated that the NBN does not need a Video (RF) overlay to distribute their programming. Not surprising since they have just made a huge investment in a terrestrial digital broadcasting network that they need to amortise. But how do they deliver their programs to "clean roof" estates?

Ericsson: also very publicly against Video (RF) Overlay. Probably because they do not have a product to offer the market. Interestingly they have teamed with 3rd party vendors in other countries to successfully install Video Overlay with their GPON offer.

Conclusion: With the aim of extending the NBN network's capabilities into the future, I believe that this ITU standard of Video or RF Overlay should be seriously considered as a service or access obligation. Not in a global National sense but providing for its installation and use in individual Headends, particularly where "clean roof" housing estates are involved.

There are millions of television viewers around the world watching broadcast television transmitted over FTTH networks today using Video Overlay.

It is an inexpensive, ITU-standard, proven and effective way of offloading several gigabits of equivalent data bandwidth from the FTTH data channel.

We believe that the NBN Co should look far more closely at this inexpensive option to maximise the National Network's future capacity.

We remain at your service to provide any further detail or references you may require.

Yours truly,

John R Nixon
CEO
Optical Network Engineering