Cambium Networks

Response to the Productivity Commissions Telecommunications Draft Recommendations

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1. CAMBIUM NETWORKS RESPONSE TO THE DRAFT RECOMMENDATION

Cambium Networks welcomes the opportunity to make further comment to the draft recommendations.

The recommendations have taken into account the input from the initial submissions. We are encouraged by the progress and agree with the draft recommendations but have some additional suggestions regarding the role of regional Wireless Internet Service Providers (WiSPs) and the role of Fixed Wireless.

We strongly agree with the recognition that technology has advanced and the current form of the TUSO is no longer relevant. High speed broadband access is now also very important and due to the convergence of technology over the past 15 years, voice communications over data is well proven and being widely deployed. Traditional telephone exchanges large and small have also become internet based and hence the ability to combine voice and data is common and continuing to grow.

We also agree that the NBN should become primarily responsible for delivering the USO. However, should be based on a new set of guidelines that cater for both broadband internet and voice and complimented by regional and rural WiSPs.

It has is clear from the feedback received, that satellite is not ideal for voice services due to latency and has issues with availability. We do not believe the latency figures quoted in Note 4 on page 12 of the report are correct and ask that you check them as we understand one way satellite latency to be as high as 700ms.

In this light, here are our input and comments to the draft recommendations:

- There is a STRONG parallel between Bridging the Digital Divide today and what the intended aim of the TUSO was when it was established.
- Fixed Wireless has a greater role to play in the delivery of high speed broadband services and these services are well suited to including voice. Technology advances over the past 6 years have made this very possible and also cost effective.
- We are very doubtful the NBN will achieve the targeted coverage by 2020. Many WiSPs are NBN RSPs, but are also building Fixed Wireless infrastructure to cover underserved areas and are an excellent complement to NBN. Allocations of USO funding to WiSPs would help to achieve the governments objectives of universal service delivery in a reasonable timeframe and also in a cost effective manner, whilst still driving suitable competition and innovation.
- The role of Regional and Rural WiSPs should be part of any USO delivery plan. WISPs are already playing a very important role and delivering very effective voice and data services to underserved areas.
- Radio Spectrum required to achieve this should be made available and the PC should be talking with the ACMA in this regard.
- There are many gaps in the proposed high speed internet that is to be provided by the NBN in regional and rural areas. Further, it should be noted that satellite has already been recognised to

be an inefficient option for business grade voice. By ONLY having a Mobile Black Spot Program the need to address underserved broadband has been overlooked.

- An excellent example is what NZ are doing with their Rural Broadband Initiative Phase 2, which includes funding regional WiSPs to provide broadband data services to underserved areas in conjunction to a program to provide mobile coverage in key black spots.

2. ABOUT CAMBIUM NETWORKS AND FIXED WIRELESS

2.1. INTRODUCTION TO CAMBIUM NETWORKS

At Cambium Networks, we support the communications of life for millions of people around the world and connect enterprise networks where other radios cannot. No matter what the conditions or locations, wherever people or networks need to be connected, our wireless broadband solutions deliver clear voice, data and video communications people and networks can rely on.

Cambium Networks provide professional grade fixed wireless broadband, microwave solutions and more recently WLAN and Voice over Data Routers. Our solutions are deployed in thousands of networks in over 150 countries, with our innovative technologies providing reliable, secure, cost-effective connectivity that's easy to deploy and proven to deliver outstanding performance metrics. To date Cambium Networks has delivered over six million radio devices, a count that continues to grow year-over-year.

Cambium Networks have proven to be respected leaders in the wireless broadband industry. We design, deploy and deliver innovative data, voice, and video connectivity solutions that enable and ensure the communications of life, empowering personal, commercial, and community growth virtually everywhere in the world.

2.2. WHAT IS FIXED WIRELESS?

In order to understand the value of Fixed Wireless, it is important to understand how it is different to Mobile Broadband (MBB). Fixed Wireless and MBB should not be confused with one another.

Mobile Broadband is synonymous with the networks that support mobile phones and are designed and built with that in mind.

Whilst similar in many respects, Fixed Wireless Broadband, does not support mobility and is optimised to provide the best results for delivery of fixed data services using radio frequency. (RF). The typical application for Fixed Wireless is to provide a fixed data service using RF, when fiber or copper are not possible, suitable, available or affordable.

Fixed Wireless is not slower than fiber! The often forgotten fact about data transmission using RF, is that it is in-fact quicker than transmitting data using light signals over glass (i.e. fiber optic) and whilst

fiber has the benefit of being able to support more capacity and is less prone to interference, it is sometimes just not cost effective or practical to deploy; as recently recognized by Google's fiber deployment efforts which have been halted due to economic hurdles. Fixed Wireless is not a replacement for fiber, but rather an excellent technology for achieving broader fixed service coverage.

Advances in RF and modulation techniques, over the past 5-10 years have now made RF an effective option for last mile FIXED SERVICES, or proving reliable and secure fixed data connections for enterprise, Internet of Things (IoT), Industrial IoT (IIoT) and ITS applications. Examples of these are backhaul for WiFi or LTE networks supporting autonomous trucks in open pit mining; and Backhaul of CCTV and Traffic Information to the traffic control room and broadband internet in regional and rural areas. Today in many places fixed wireless is a viable last mile solution in metro areas, where legacy copper cannot support the required bandwidth and fiber is not available.

Mobile Broadband technology, like TDD LTE, has been adapted to support Fixed Wireless and is effectively used today for Fixed Wireless by nbn. There is no specific standard for fixed wireless and many vendors like Cambium Networks, have developed the required Layer 2 protocols to support reliable Point to Point (PTP) and Point to Multipoint (PMP) services.

So fixed wireless should not be confused with mobile broadband and WiFi services.

Some key attributes of Fixed Wireless:

- Low latency
- Layer 2
- Ability to be implemented with variable symmetry i.e.,. Asymmetric to emulate ADSL and LTE, symmetric to support business grade services or even with reverse asymmetry to support CCTV (Safe City initiatives) and other backhaul needs.
- Secure

2.3. WHY THE NEED FOR FIXED WIRELESS.

Fixed Wireless allows service providers to build backhaul (PTP) and last mile access (PMP) infrastructure in difficult to reach, remote or rural locations that do not have access to fixed line broadband.

Fixed Wireless is a proven solution for connecting the unconnected, when fiber or copper are not available, cost effective or feasible due to geography or cost.

Fixed Wireless is vital for helping to bridge the digital divide and this is gaining greater recognition and acceptance.

2.4. WHY IS THERE NOT MORE FIXED WIRELESS?

Fixed Wireless has been largely ignored by Tier 1 carriers as they focused on high revenue services delivered by mobile broadband, and hence the focus has been on building the best possible 2G, 3G, 4G and perhaps soon 5G infrastructure.

There is no specific standard for Fixed Wireless, but for some time WiMAX (IEEE 802.16) was considered the standard for Fixed Wireless. It was actually developed for both fixed and mobile broadband, but when LTE won the technology battle for mobile broadband, the drive and focus was to build mobile networks.

We suggest that the poor mobile experience and high latency of WiMAX stalled the deployment of Fixed Wireless.

Some reasons we believe why WiMAX was not a greater success:

- High latency of >30ms

- Limited bandwidth, as services were typically limited by paired FDD spectrum of 3.5MHz, 7MHz or at most but not often10MHz channels

- So called WiMAX spectrum, was allocated in the 2.3 GHz and 3.3- 3.6 GHz bands, both of which are not ideal for having indoor CPE. So when WiMAX modems were placed indoor the service often suffered from poor performance and this coupled with high latency lead to the demise of many fixed wireless solutions in tier 1 carriers

Now also the bandwidth in many places was not coordinated for more suitable TDD solutions. Instead fixed wireless solution grew in leaps and bound in the 2.4 GHz and even more so in the 5 GHz ISM bands, driven by cost effective technology and entrepreneurial Wireless Services Providers (WiSPs) that grasped the opportunity to build networks to deliver broadband services in areas and regions that were not effectively served by Tier 1 Service providers.

With the end of life of WiMAX chipsets, other more suitable TDD, Fixed Wireless Solutions and technology, able to make use of the small amount of licensed spectrum available in the 3 GHz bands emerged.

In Australia the NBN was built with Fixed TTD LTE in the 2.3 GHz initially and perhaps 3.4 GHz more recently. (See Appendix A)

Enterprises like some of the larger mining companies, and TMR QLD found value in the solution and started to build what were effectively early IoT networks.

2.5. LTE AND FIXED WIRELESS

We have seen proprietary dedicated Fixed Wireless solutions emerge from vendors like Cambium Networks, but the large telco equipment vendors, recognised the market opportunity to sell LTE as a standards base fixed wireless solution and we have seen TDD LTE emerge.

LTE is however layer 3 by design, requires a more complex enterprise packet core that adds cost, asymmetric by design and hence has some limitations vs lower cost more flexible non standards based solutions.

2.6. WHY THE NEED FOR LICENSED SPECTRUM FOR FIXED WIRELESS.

Almost all service providers prefer the certainty provided by licensed spectrum to be able to justify the investment in Fixed Wireless Infrastructure.

The remote and regional WiSPs were OK to deploy Fixed Wireless in unlicensed bands, typically 5.8GHz band. For the most part it has proven to be reliable and secure, but as some areas become more popular and more networks were built, congestion resulted and the need for licensed band for Fixed Wireless started to grow. Certain enterprise and industrial applications also cannot risk possible interference, so when the ACMA allocated the 3.55 GHz to 3.7 GHz band in 2009/10 the opportunities in the market started to grow due to the ability to build and invest with confidence

More and more the need for licensed spectrum has grown.

Fixed Wireless is now a proven and well respected solution for bridging the digital divide, but small service providers' just as large ones need the certainty and comfort offered by licensed spectrum for delivering interference free broadband services, especially as part of a USO commitment.

It is important, however, that the licensed spectrum for regional and rural areas remains cost effective to enable networks to be built and deliver the required services in underserved areas. Spectrum for IIoT and ITS services in metro areas is also now required and so too does this spectrum need to be priced affordably as it is now in regional towns.