Australia's Academic and Research Network

5th August, 2018

Regional Telecommunications Review 2018: AARNet Submission

Executive Summary

1. The critical issue for regional telecommunications is access to competitive long-haul backbone and **backhaul services rather than "last mile" access**.

   While the national policy agenda is rapidly shifting, it has been centred on the provision of telecommunications services to **individual homes, rather than to schools, TAFEs, health care facilities and other government service agencies** (eg. nbn and mobile blackspots). This disproportionally impacts organisations and institutions in regional communities

2. **Investments in regional telecommunications have generally have limited long term impact** because they have a narrow technology focus (eg. mobile phone towers), are focussed on specific vertical opportunity (eg. telehealth) or provide a relatively short-term return on investment (usually because the infrastructure ends up being owned by a single monopoly provider).

AARNet recommends that future policy and investments:

- Increase the availability, quality and competitiveness of fixed long-haul telecommunications (fibre) infrastructure to and between regional communities;
- Support the improvement in digital service delivery for institutions relevant to, and located within, regional communities; and
- Provide long-term (decadal), cross-sectoral benefits to regional communities.
- Collect and consolidate the necessary data for all schools in Australia, both public and private, to determine the actual delivered bandwidth and quality of the Internet experience provided to schools in Australia to highlight the existing shortfalls.

Specifically:

- **That the nbn offer services more appropriately aligned to the requirements of government services, education, health, emergency services and businesses, within regional communities, and**

- **Long-distance and backhaul fibre or equivalent open access services be made available to, and along highways between, regional communities either via the nbn, or through investments in related infrastructure.**

AARNet Background

AARNet (the Australian Academic and Research Network) was established in 1989 by the (then) Australian Vice-Chancellors Committee and CSIRO to create Australia's National Research and Education Network (NREN). Like other NREN's around the world, AARNet interconnects its members' institutions nationally, and provides international connectivity via other NRENs to the global research and education community. AARNet brought the Internet to Australia and continues to pioneer the use of the Internet and Internet technologies.

AARNet Pty Ltd is a licensed telecommunications carrier operating as a not-for-profit company limited by shares and owned by the universities and CSIRO. AARNet provides ultra-high speed, very high-quality broadband telecommunications services that are not commercially available (technically unique), or not available at reasonable cost (commercially unique) to **Australian research and education organisations**.

AARNet has over 250 directly connected member and customer institutions. Members are the **Australian universities and CSIRO**, and customers include scientific research organisations, numerous **TAFE's** and training organisations including health training, more than 700 **primary and high schools**, and a variety of galleries, libraries, archives and museums (GLAMs). AARNet's operational costs are covered through a membership subscription model.

2018 Issues Paper Questions

1. What are the main barriers to people in regional communities increasing their use of digital technologies and possible solutions for overcoming these barriers?

The main barriers to further adoption of digital technologies in regional communities are the availability and affordability of genuinely transformational broadband services within regional for schools, TAFE campuses, libraries, health care facilities and businesses larger than a Small Office/Home Office (SOHO). The current range of services provided by the NBN are not technically appropriate, too costly and not universally available throughout regional and rural Australia for these types of organisations.

AARNet believes either or both of the following approaches would address these issues:

- Co-investment in long-haul and backhaul fibre to and between regional communities under an open access arrangement, leveraging related infrastructure (eg. mobile phone towers, roads, railways, gas and water utilities, power infrastructure) and partnerships with State and Local governments and telecommunications providers, and
- Instruct the nbn to offer services better aligned to the technical and commercial requirements of government services, education, health, emergency services and businesses, within regional communities

2. How are people in regional communities currently using their broadband service and how might they increase the benefits of using this technology?

Regional Australians have always been more reliant on telecommunications and unique remote service delivery mechanisms than their countrymen and countrywomen in urban cities, eg. The School of the Air and the Royal Flying Doctor Service. These approaches have been necessary to address both the remoteness of regional Australians from both services and expertise, and the very low density of people within regional Australia.

With the rapid, and increasing, rate of innovation and increasing opportunity made possible through information and communication technology (ICT), the issue is less one of increasing the benefits that flow to regional communities from using digital technologies, but more one of ensuring there is parity between regional broadband and related digital services in regional Australia and metropolitan Australia both for individuals and for organisations.

Australia's Federal broadband policy has been largely focussed on end-user and/or residential access, eg. the national broadband network (nbn) and mobile phone blackspots. Apart from the Regional Blackspots Backhaul Program (RBBP) in 2010, very little has been done to address the lack of affordable broadband services for institutions (schools, hospitals, libraries, study hubs, businesses) for which the nbn and mobile services are not appropriate. For regional communities, it is the availability and the affordability of backhaul telecommunications in regional and rural Australia that needs to be addressed through co-investment and partnership arrangements with Federal, State and Local governments, telecommunications providers, traditional utilities (such as water, gas, power) to significantly increase the amount of open access fibre into and within regional Australia.

3. What data-intensive activities are occurring in regional, rural and remote Australia? What digital technologies are needed for these?

Across regional and rural Australia, some of the most data-intensive activities that need to occur are in education and health. The lack of availability and unaffordability of genuinely transformational broadband services for schools and hospitals (eg. a minimum 1Gbps service) in these regions is unacceptable in a country investing tens of billions of dollars in broadband infrastructure.

A seismic shift is required to improve broadband services to schools, particularly in regional, remote and rural Australia to remove any barriers (capacity and cost) to accessing digital resources and innovative curriculum, adopting assessment techniques and developing pedagogies to support schools teaching and learning mission. Regional, rural and remote locations have the most to gain from such a shift, as affordable, higher quality broadband is capable of delivering rich media learning resources and high quality, low-latency video streaming and video conferencing that mitigate distance and isolation.

The National Broadband Network (NBN) is designed to support individual residences and homes. The services provided by the NBN are expensive and technically inadequate to meet the needs of schools or institutions, given the intense usage profile (9am-3pm) of schools, the concentration of users (typically hundreds of students and teachers) and the increasing dependency of schools on high bandwidth, high quality, always-available broadband. For schools in remote Australia that can only receive service through the SkyMuster satellite, even the Public Interest Premise (PIP) arrangements are inadequate to meet the needs of all but the smallest schools. For remote distance education students, the SkyMuster service is currently constrained by a wide range of complex quotas, further limiting the ability it has to serve these very disadvantaged students.

Most state schools in regional and rural Australia receive broadband services through their respective Departments of Education, but in many cases the bandwidth provided falls short of what is needed to remove barriers to innovative teaching. AARNet would encourage the Commonwealth to undertake a survey of all schools in Australia to collect up to date data to determine the actual delivered bandwidth and quality of Internet access provided to schools in Australia to determine the shortfall that might exist.

4. How can regional businesses better utilise digital technologies to maximise economic benefits?

Regional businesses will utilise digital technologies to maximise their economic benefits when these technologies are readily available and affordable. If regional businesses have metro-equivalent digital technologies *and* can access skilled staff, that have had access to teaching and learning opportunities that are not constrained by lack of digital services, then they can be globally competitive.

In particular, where business rely on the TAFE system for staff training and apprenticeships, access to digital technologies supported by high quality, high speed Internet connectivity can provide transformational training opportunities. Regional areas can suffer through a lack of access to quality teaching resources, both human and curricula. Access to these digital technologies can level the playing field between regional and city training delivery.

5. What can be done to improve access to and uptake of telecommunications services in remote Indigenous communities?

AARNet would strongly recommend taking a community approach to improving the access to and uptake of telecommunications services in remote Indigenous communities. This approach would focus on broadband enabling the core institutions within communities – schools, health care centres, community centres, study hubs, libraries – as these are the structures that are needed to translate access to broadband services into social impact. They would also serve as focus points for individuals to access broadband through WiFi hotspots at these locations. Development of the Public Interest Premise concept, potentially as part of the proposed Enterprise Satellite Service offerings, may been a mechanism to enable this approach.

6. Are there practical examples of how communications services can improve the well-being of people in remote Indigenous communities?

AARNet provides Internet services to eleven remote school communities that are part of the Association of Independent Schools Western Australia (AISWA) in the Kimberley, Pilbara, Gold Fields and Esperance regions of Western Australia via national broadband network (NBN) satellite tail connections (see Appendix B for further details).

Although this is has been a positive outcome for AISWA, it has in spite of many challenges and limitations imposed by the NBN regarding usage of the SkyMuster services to provide services to the schools. The technical requirements (bandwidth, download needs) of even a modest sized school are substantially greater than those of a single home, highlighting the inadequacy of the standard nbn service offerings to meet the requirements of schools.

AARNet is also working with the University of South Australia (UniSA) to provide services via SkyMuster to support the Aṉangu Tertiary Education Program (AnTEP) centred around Ernabella in remote South Australia.

7. What skills do people need to get the most from their digital technologies, and where can they learn these skills?

The use of digital technologies needs to be integrated into all aspects of life. For most Australians this will be learnt through formal education at school, and from their parents. In circumstances where the digital skills of parents are low, additional investment is required to provide appropriate digital facilities and digitally trained teaching staff in schools, innovations hubs, study centres and TAFE campuses.

8. Have you had ongoing issues affecting your satellite or fixed wireless broadband service? If so, how have you overcome these issues?

AARNet's has mitigated the bandwidth and download limit issues associated with using the nbn SkyMuster services to provide broadband Internet services to schools (see Appendix B), through the following mechanisms, including:

- Raising the issue with nbn through their Retail Service Provider (RSP) engagement team, who provided some leniency regarding the quotas

- Provisioning multiple nbn SkyMuster services into specific schools to provide sufficient download capacity and/or bandwidth
- Deploying a number of bandwidth optimisation and monitoring tools to attempt to manage bandwidth usage and downloads within the quotas and limits applied by the nbn
- Raising the issues with the Minister Regional Telecommunications (at the time, Senator Fiona Nash) at a roundtable of Sky Muster RSPs. The topics and suggestions highlighted in that consultation are attached as Appendix A.

9. If you are in an area with access to the Sky Muster satellite service and you have not taken it up, why not?

AARNet has not provided SkyMuster services to any customers apart from the AISWA schools as outlined in Appendix B because it is uneconomic to do so. The cost of bandwidth (specifically the CVC charge) and the rules that are applied to how CVC capacity can be provisioned make it impractical for a relatively small nbn RSP like AARNet to use Sky Muster to provide the services required by our customers.

10. What economic or social indicators could be used to guide investment to further improve mobile coverage?

All mobile coverage has some form of backbone or backhaul component which underpins the raw data capacity and connectivity of the mobile service(s) by providing the trunk communications links between the mobile base stations and existing fixed telecommunications infrastructure. It can be implemented using fibre, or a range of fixed wireless technologies. Although investment in fibre has a higher capital expense, it provides a much longer (many decades) and much higher return on investment and can be more readily leveraged to support other telecommunications services and multiple telecommunications providers. To address both mobile coverage, and improved services for regional service delivery agencies, AARNet recommends the deployment of fixed long-haul telecommunications (fibre) infrastructure to and between regional communities, and that this backhaul infrastructure and towers be made available an open access basis to improve competition.

11. Is information readily available regarding how to use devices to improve mobile reception in areas with poor coverage? e.g. information about external antenna equipment?

AARNet has no position on this question.

12. What emerging digital services will be of most benefit to regional businesses and what are the data needs of these services?

For regional businesses to be successful, they must have access to the same digital services, at comparable prices, to those available to metropolitan businesses (and more broadly, international businesses). This is particularly the case for services not offered by the nbn. In metropolitan areas there is intense competition from a wide range of providers for high bandwidth, high quality digital services to meet the specific needs of businesses, as well as schools, hospitals and libraries, which simply does not exist universally across regional Australia. As noted above (Q2), this can be addressed by facilitating alternative fibre backhaul for regional communities.

13. What broadband services are people using other than those available through the NBN?

AARNet provides ultra-high speed, ultra-high quality broadband and other digital services to a wide range of regional organisations based on the "anchor tenancy provided" by our shareholder universities and CSIRO. These services are predominantly provided over fibre optic infrastructure that AARNet has built or has secured long-term access too. The narrative is:

- **The majority of Australian universities operate within and throughout regional Australia** through a range of mechanisms including regional campuses, study centres, research facilities and partnerships with other institutions including TAFE[1]s.
- The **universities that serve and support regional Australia play prominent roles in their communities**, not just as educational institutions, but as major employers, centres for support services and as a community hubs.
- Digital technologies and networking services provided by AARNet into regional Australia enables institutions to overcome some of the traditional issues of isolation and disadvantage common to many regional organisations. Connectivity and the rapid adoption of new digital modes of learning unpins **access to content, resources, and people that enable the creation and delivery of new digitally-enabled educational experiences** (online teaching, flipped classrooms, blended learning, MOOCs). For educators and researchers, in an increasingly globalised and digitally-enabled world, AARNet removes barriers to innovation.
- Digitally well-connected regional universities play a role as an **anchor tenant for network infrastructure** (from AARNet), which enables schools, TAFE's, hospitals, galleries, libraries, archives and museums (GLAMs) and other education and research institutions to reap the benefits of this transformative technology[2]. In the 21st century, digital connectivity is just as important for regional development as bricks and mortar infrastructure.

Examples of the anchor tenant model include:

- **AARNet enables innovation in teaching and learning for regional schools**
  https://news.aarnet.edu.au/aarnet-enables-innovation-in-teaching-and-learning-for-regional-schools/
  AARNet connectivity provides the cost efficient, congestion-free broadband that allows schools in regional Australia to access cloud services and content providers from around the globe, collaborate with each other and their city peers, and embrace innovative methods of teaching and learning.
- **Future-proofing a regional school**
  https://www.aarnet.edu.au/case-studies/future-proofing-a-regional-school

  A diverse connection to the AARNet network 'future-proofs' a regional school, where reliable internet supports classroom teaching, links students to metropolitan experts and underpins the adoption of new technologies.

[1] Colleges of Technical and Further Education (TAFE)
[2] For more information see http://www.aarnet.edu.au/communities/

- **Bridging the digital divide in regional Australia**
  https://www.aarnet.edu.au/case-studies/bridging-the-digital-divide-in-regional-australia

  The Highlands Health Education Research Network exemplifies an AARNet community partnership delivering a scalable and sustainable broadband solution for schools in a regional area.

14. How can more competition be encouraged in the provision of broadband services in regional Australia?

AARNet is strongly of the view that:

- The critical issue for regional telecommunications is access to competitive long-haul backbone and backhaul services rather than "last mile" access.
- Much of the national policy agenda has been centred on the provision of telecommunications services to homes and individuals (eg. nbn and mobile blackspots), rather than to schools, TAFEs, health care facilities and other government service agencies. This disproportionally impacts organisations and institutions in regional communities.
- Investments in regional telecommunications have generally had limited long term impact because they have
  a) a narrow technology focus (eg. mobile phone towers),
  b) are focussed on specific vertical opportunity (eg. telehealth), or
  c) provide a relatively short-term return on investment (usually because the infrastructure ends up being owned by a single monopoly provider).

AARNet believes either or both of the following approaches would address these challenges:

- Co-investment in long-haul and backhaul fibre to and between regional communities under an open access arrangement, leveraging related infrastructure (eg. mobile phone towers, roads, railways, gas and water utilities, power infrastructure) and partnerships with State and Local governments and telecommunications providers, and
- Instruct the nbn to offer services better aligned to the technical and commercial requirements of government services, education, health, emergency services and businesses, within regional communities

Providing "open access" to such infrastructure is only a pre-requisite to enabling competition digital services. Ensuring the costs associated with providing open access are not a barrier (which has occurred with some programs funded by both the Commonwealth and the States) is crucial, and AARNet would recommend approaches that are based on "cost plus", or that even reserve capacity for public interest/community benefit would be more appropriate.

15. Anything else you would like to raise?

The quality of education, as well as health and other government services such as libraries and social services, are critical factors in determining where individuals and families choose to live. To ensure Australia's regional communities remain vibrant, they must be attractive compared to urban communities, not only regarding the quality of home or residential and mobile telecommunications services, but also regarding the quality of services that are available regionally. For education, this

means attracting and retaining the best teaching staff, providing those teaching staff with access to the most modern teaching methods and resources available, and **ensuring the digital experiences students can enjoy in regional institutions are at least as good as those in metropolitan institutions**.

Further Information

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Appendix A – AARNET, Sky Muster and public interest premises

Key Issues

AARNet has had a robust, highly professional and constructive dialogue with NBN around SkyMuster issues and wishes to share this feedback in this context.

The structure of NBN products available to schools and other Public Interest Premises is very similar to the structure of residential products. While NBN has made some concessions regarding quotas, and tweaks around some product attributes offered, the core products are essentially similar in terms of both structure and pricing.

Internet demand at a school, however, is vastly different to residential usage. Particularly, schools aggregate many more users into one premises than would occupy a residence: hence, the number of users sharing a SkyMuster service at a school (possibly several hundred people) will be considerably greater than those sharing a residential service (typically 2-5 people).

Peak Internet usage times at a typical school (and likely other PIPs such as medical facilities) do not overlap with typical residential peak times. This presents an opportunity to offer differentiated products to PIP customers without necessarily sacrificing bandwidth available for residential use.

Opportunities

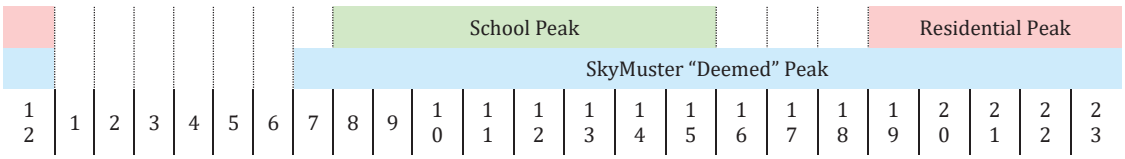
The above issues along with learnings from the first months of SkyMuster usage offer an opportunity to structure differentiated products around the unique needs of PIPs.

In particular, the following would help to address these needs:

1. a significantly reduced, PIP-specific CVC price
2. removal of the ratio of services to CVC bandwidth
3. significantly higher quotas available to PIPs during differentiated peak times

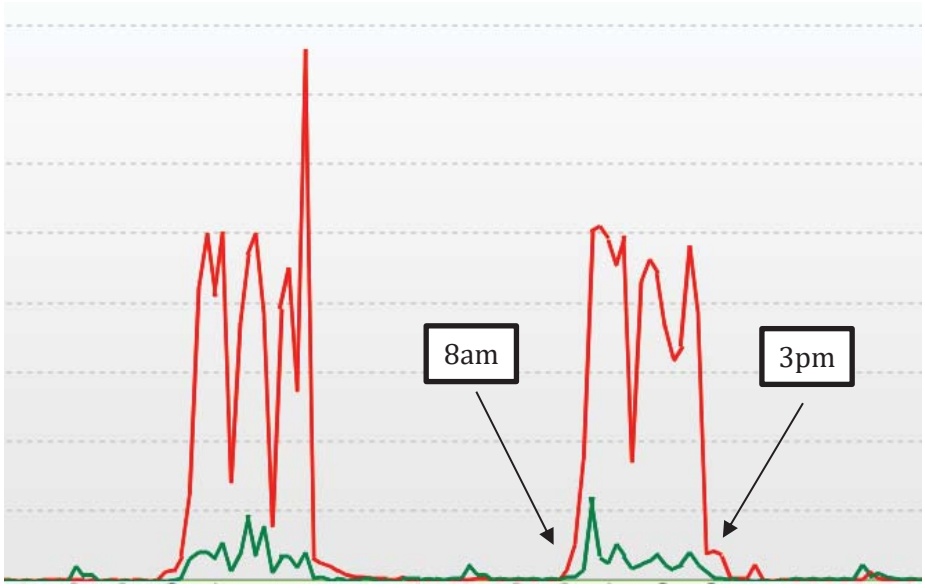
Peak Usage Comparison

The below schedule indicates generally accepted peak hours of the day, by customer type (weekdays), alongside the deemed peak times applied to SkyMuster services.



Typical school peak: 8am to 3pm *(source: AARNet – see below));* Typical residential peak: 7pm to 1am *(source: Cisco VNI/Wikipedia);* NBN SkyMuster peak: 7**am** to 1am

Typical School Peak Usage (source: AARNet)



Appendix B

Downloaded from https://news.aarnet.edu.au/remote-schools-in-wa-connect-to-aarnet-via-nbn-satellite/ (4th August, 2018)

Remote WA schools connect to AARNet via NBN satellite

Access to reliable high speed broadband and online resources enriches the classroom experience for students in remote schools. Photo: AISWA

SEPTEMBER 18, 2013

AARNet recently connected eleven remote school communities in the Kimberley, Pilbara, Gold Fields and Esperence regions of Western Australia to the AARNet network via national broadband network (NBN) satellite tail connections.

The project is part of an ongoing collaboration between AARNet and the Association of Independent Schools Western Australia (AISWA) providing reliable high speed broadband and the latest teaching and learning technologies to some of the most remote schools in the nation.

Satellite broadband expands teaching and learning opportunities

AISWA's Manager of Learning Technologies Peter Crosbie said, "Broadband goes a long way to enhance and enrich teaching and learning in the classroom and we needed to put a reliable satellite service with faster upload and download speeds into these schools". He says that with 78 sites across eleven remote school communities now connected to AARNet, AISWA is on its way to achieving its goal of equity in the provision of broadband services across all WA private and independent schools.

Virtual excursions and professional development

In addition to enriching the classroom experience for students through video conferencing and virtual excursions to far-away places, Crosbie says reliable high speed broadband will provide teachers and administrative staff with access to professional development and on-the-job training without the expense and time away of travel.

“Now that we have the means, we’re looking at content and building up teachers’ ICT skills, for video conferencing and collaborating with other teachers locally and globally. With many resources for the Australian curriculum now online, it’s opening up opportunities we didn’t have before,” he said.

AARNet is continuing to work with AISWA and vendors to optimise available learning technologies for satellite broadband.

Schools can connect to AARNet in different ways

AARNet connects K-12 schools across Australia in a variety of ways, providing direct connections and National Broadband Network (NBN) tail connections to AARNet’s high-speed research and education network, services and community, depending on location and other factors.