

The Broadband Futures Forum

Regional Connectivity and Shared Infrastructure in NSW and New Zealand

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Abstract: On 13 April 2022, TelSoc hosted the thirteenth Broadband Futures Forum, held online, to describe the initiatives in New South Wales, Australia, and New Zealand for greater regional availability of broadband access and the implementation of shared infrastructure in regional areas. There were three speakers: one speaker from New South Wales on the trials and plans in that State; and two speakers from New Zealand on the government actions and commercial response to provide broadband services in otherwise unserved areas. Discussion after the presentations probed details of each initiative and expanded comparisons between the two countries' approaches.

Keywords: Broadband, regional connectivity, shared infrastructure

Introduction

The Broadband Futures Project ([Holmes & Campbell, 2019](#)) has been organizing a series of public forums under the title Broadband Futures to encourage debate, and potentially to build consensus, about the future of Australia's National Broadband Network (NBN) and a National Broadband Strategy for Australia ([Holmes et al., 2020](#)). The forums are hosted by TelSoc (the Telecommunications Association Inc., publisher of this *Journal*) and have been held regularly since July 2019.ⁱ The thirteenth in the series, held on 13 April 2022, was entitled "Regional Connectivity and Shared Infrastructure: NSW and New Zealand" and provided an overview of new initiatives in New South Wales (Australia) and New Zealand on the expansion of regional broadband access and the shared infrastructure that supports it.

The remainder of this paper summarizes the content of the Forum.

The NBN Futures Forum

The Forum was conducted online via Zoom, with at least 32 participants online. Dr Murray Milner from the TelSoc Broadband Futures Group chaired the Forum.

He noted the timeliness of the Forum. The Australian Government had just published its response to the Regional Telecommunications Review conducted in 2021. Recommendation 10 of that review had proposed that government give preference in funding to mobile towers and other infrastructure that provided shared network access. In response, the Government had said that it would seek a neutral-host solution for funding under the Connecting Rural Australia initiative and would draw lessons from international experience, including comparisons with New Zealand.

NSW Regional Digital Connectivity Program

Peter Adams began by noting that the NSW Regional Digital Connectivity program is based on a 20-year economic vision for regional New South Wales (NSW), last updated in February 2021 ([NSW Government, 2021](#)). The vision gave special mention to digital infrastructure, to lift productivity and growth, and to technology-enabled primary industries. He indicated that the emphasis in telecommunications provision was in rural and remote underserved areas of the State. The Regional Digital Connectivity Program has funding of AUD 400 million, as part of a larger program to invest in transformational and economically productive infrastructure, plus other ongoing initiatives. The two main budget items are:

- \$300M for mobile coverage, to improve mobile connectivity where people live and work. Peter Adams noted that this funding is additional to the Commonwealth support for overcoming mobile blackspots.
- \$100M for a “Gig State” initiative to bring metro-level Internet service and pricing to regional NSW.

Because the funding for additional mobile coverage is comparable to the Commonwealth support, it was decided to use the first \$50M to undertake some trials with industry to gather data for a full business case for the remaining funds. There are four trials to begin later in 2022 and run for about four months: on MORAN (Multi-Operator Radio Access Network (RAN)); on MOCN (Multi-Operator Core Network); on Open RAN; and on domestic roaming. The aim will be to develop a suite of commercial and technical frameworks suitable for the variety of rural, regional, and remote circumstances in NSW. Where possible, there will be alignment with support for emergency services communications.

The “Gig State” initiative is primarily about Internet access and backhaul. There are 131,000 premises in NSW whose only option for Internet access is via satellite. Providing alternatives for these premises through Fixed Wireless Access (FWA) or, potentially, a more modern LEO service is a priority. The total funding will not be sufficient for all these services: if they each could have been connected for \$5,000 or less, they would likely have been connected to FWA by the National Broadband Network. The total cost of improved connectivity would therefore be above \$650M and probably much more. There had also been an initial challenge in that the funding had been profiled as a capital investment by NSW Treasury. This has since been changed to operational expenditure, meaning that direct grants programs can be run.

There are two initiatives currently underway. One is to move premises west of Cobar onto FWA. The other is a trial in a hilly and rocky area near Queanbeyan to explore cost-effective distributed designs.

The NSW Government had made a submission to the Commonwealth’s Regional Telecommunications Review 2021. The NSW Government’s recommendations were clustered in three areas: the need for sharing of infrastructure co-funded by government; the availability of radio spectrum for States or Territories; and the need for industry to flatten their backhaul and business Internet pricing.

The industry is now moving in a direction that is compatible with what the governments are trying to achieve. The sale of mobile towers by Optus and Telstra means that there are tower operators who can service the industry as a whole. The Commonwealth is trialling a “neutral host” mobile delivery model with industry. Open RAN technologies are being developed. These all support a sharing model for government-funded infrastructure.

After the announcement of the Regional Digital Connectivity program, there have been some beneficial responses by the telecommunications industry:

- NBN Business Fibre Zones are being established. They deliver metropolitan prices for fibre access in regional areas.
- Backhaul prices have dropped significantly. There are areas in which prices are now 15–20% of what they were one or two years ago.
- Nine regional data centres are being built in NSW and a further nine have been announced.

The Stage 1 trials for the Mobile Coverage Program are based on prioritising competition and collaboration over single-operator coverage outcomes and seek to address any perceived barriers to participation by the private sector. Stage 1 will identify appropriate technical solutions, delivery models and commercial arrangements: these will be identified and signed off by the industry partners participating in the trials. The following \$250M main round will

then use the learnings from Stage 1 to deliver transformative models for mobile coverage in rural and regional NSW.

In addition to the programs described above, there is also a “Farms of the Future” program that is designed to accelerate the adoption of agricultural technologies by NSW farm businesses. The program has five pilot regions targeting NSW’s highest grossing agricultural sectors. There are three core streams: connectivity to improve backhaul in pilot regions; education and capacity building to improve understanding of the benefits of ag-tech; and grants to subsidise the cost of devices to stimulate uptake.

The NSW Government will continue to cooperate with the Commonwealth Government on regional connectivity programs and the Mobile Blackspots Program. In addition, the NSW program is responding to short-term coverage needs: for example, it is improving mobile coverage on the Snowy Mountains Highway for safety reasons in the light of increased construction traffic on the road.

Rural Coverage in New Zealand using Shared Cellular sites

Steve Inglis and John Proctor presented this section of the Forum.

The New Zealand Government had set an aspirational goal that, by 2025, 99% of New Zealanders should be able to access broadband at peak speeds of at least 50 Mbps and the remaining 1% should be able to access at least 10 Mbps. To date, about 86% of premises have fibre access and, of these, 68% are taking broadband service at 1 Gbps or greater.

The Government has now embarked on a Rural Broadband Initiative, phase 2, (RBI2) since 2016 to provide high-speed broadband access to the greatest number of rural end-users within the available funding; and to do so by providing similar high-speed broadband access across all regions of rural New Zealand. Eligible end-users are those with terrestrial access to only 20 Mbps peak rate, or less, and who are not in the footprint of fibre, VDSL or 4G wireless broadband. Service providers to be supported under RBI2 must commit to being able to provide an HD video stream and two other less onerous applications in parallel without significant buffering.

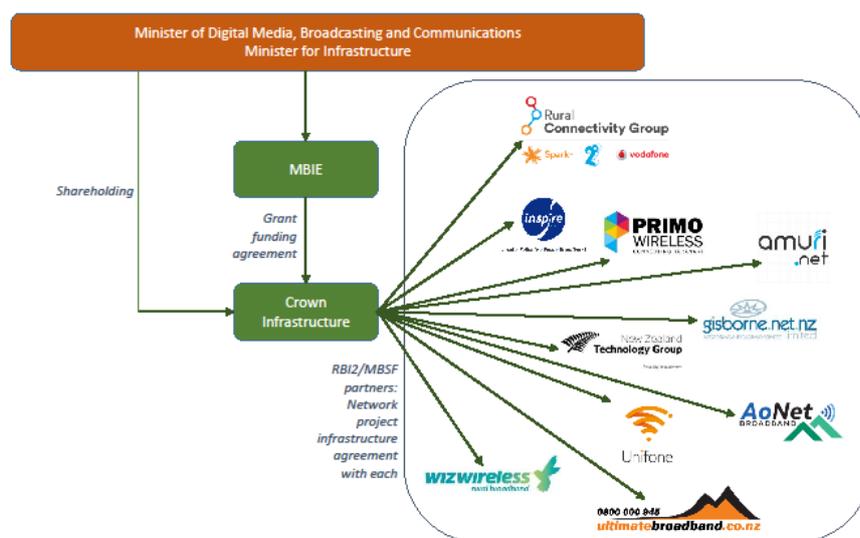
There is also a Mobile Black Spots Fund (MBSF) to improve availability of mobile services along State Highways and at key tourist destinations. Unlike the Australian program, the Fund does not currently support the provision of mobile services to communities in general. Eligible locations must otherwise have no mobile service. The Fund supports a minimum level of voice, text and data service. All new towers have 4G radios. However, where there is a need for health and safety coverage (e.g., long stretches of highway or remote track ends), an overlay of 3G is added to maximise the number of compatible devices that can access emergency services.

Segments of State Highways were ranked in priority by traffic volume, distance to existing coverage, and the frequency of emergencies. Tourism destinations were ranked by visitor numbers.

For RBI2 and MBSF together, a budget of NZ\$150M was provided from a telecommunications industry levy. The Government had requested information from local Councils in 2015 and had compiled a long list of possible candidate areas for support.

Crown Infrastructure Partners undertook a detailed data analysis exercise, including coverage data from mobile service providers, to compile the final list of initiatives to be supported. A request for proposals was issued in October 2016, with responses due by February 2017 (somewhat delayed by a large earthquake). After an evaluation of commercial, technical and geospatial aspects had been completed, contracts for service provision were announced in August 2017.

RBI2/MBSF programme structure



Commercial in Confidence

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Figure 1. RBI2/MBSF broad program structure (Source: Crown Infrastructure Partners)

Figure 1 shows the general management structure of the two programs. The structure has broadly remained stable over several changes of government. Of the partner organizations shown in Figure 1, most are WISPs – Wireless Internet Service Providers. The WISPs are generally small organizations but are highly agile and adaptive to their local environment. They provide very cost-effective solutions in all corners of the country.

To respond to RBI2, the Mobile Network Operators, Spark, Vodafone and 2degrees, set up a joint venture (which required Commerce Commission clearance) called Rural Connectivity Group (RCG). RCG was appointed by the government to deliver the RBI2 and MBSF programs.

It secures land and builds, operates and maintains a 4G broadband and mobile network, together with a 3G overlay for mobile blackspots. RCG is not a service retailer: it delivers connectivity for retailers to use.

In addition to the NZ\$150M from the government, RCG was given NZ\$75M in capital from the three Mobile Network Operators and the spectrum needed for the network. The operations costs are fully funded by the Operators. An expansion program is funded by Crown Infrastructure Partners on a tower-by-tower basis. RCG is a cost-conscious, lean organization of approximately 50 people that encourages technology innovation.

The aim is to have about 500 cell sites operational by December 2023. Currently, there are 330 cell sites and 68 tourist destinations covered. Each cell site supports services from Spark, Vodafone and 2degrees, as well as providing co-location capacity for at least one WISP. The current network covers 27,650 households and 742 km of State Highways. The targets are for 34,000 rural homes and businesses with broadband coverage of at least 20 Mbps, 1,000 km of mobile coverage over 32 State Highways, and coverage for 100 tourist hotspots. The main service uses 4G wireless broadband, with 3G mobile coverage for roads and tourist locations without service from any operator. A recent highlight has been a brand-new network on the Chatham Islands, where there had previously been no communications network at all.

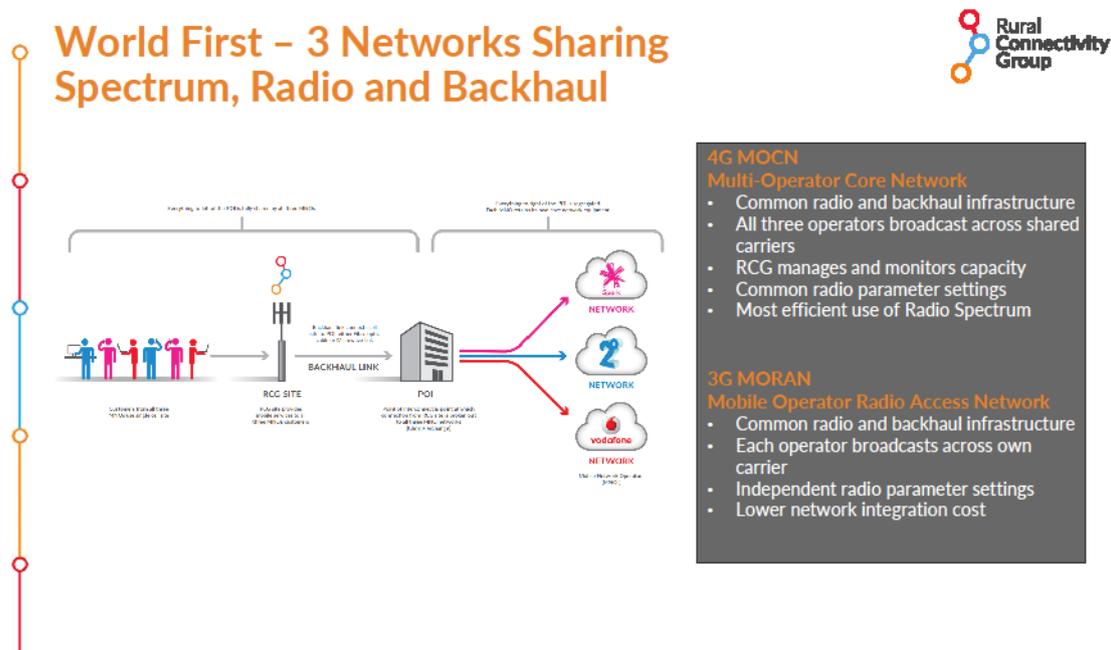


Figure 2. 4G Multi-Operator Core Network configuration (Source: Rural Connectivity Group)

Figure 2 shows the 4G Multi-Operator Core Network (MOCN) architecture used by RCG. This has been an early implementation of 4G MOCN with three operators. It provides for the most efficient use of radio spectrum. In addition, RCG supports 3G Mobile Operator Radio Access

Network (MORAN) configurations, which permit independent operation of the radio networks without spectrum sharing.

RCG has found that rural communities really welcome mobile coverage, in addition to the broadband service provided via RBI2. RCG's activities are restricted to areas where it is "non-economic for any one operator", but the model could be beneficial in other areas as well.

There have been many challenges in rolling out a network in rural and remote areas. A key consideration is powering: a large site typically needs 1.5-2 MW, for which off-grid power solutions are large and expensive. Backhaul transmission of sufficient quality, e.g., via satellite, is also expensive. There are many issues with access to sites, especially due to the New Zealand weather and topography.

The main program, which was planned in 2014, has been adapted to respond to the dynamic environment of the actual rollout. Rural Connectivity Group and Crown Infrastructure Partners have worked well together to modify the program. The expansion program of new sites provides great flexibility, but the required site-by-site business case development is somewhat inefficient.

There have been technical challenges. The MOCN technology is new, so the rollout has faced novel configurations, like MOCN over satellite links. RCG has worked with its suppliers to develop solutions. In addition, the Mobile Network Operators and the WISPs have different standards for performance and cost that need to be harmonized.

A balance between commercial and government requirements has been needed. The Operators may, for example, favour connecting as many homes as possible, while Crown Infrastructure Partners may have other priorities to cover emergency-services sites.

Rural Connectivity Group, as a consortium of Mobile Network Operators, is privy to highly confidential data from its partners on business plans and projected demand and has had to develop strong procedures to keep this material confidential. It also has restrictions on its operations from the Commerce Commission to protect normal competition in other areas.

As a result of its experience, RCG would recommend:

- The use of MOCN technology for efficient use of spectrum;
- An independent structure for a joint venture but with an essential relationship with its Mobile Network Operators and effective control of confidential data;
- A careful consideration of where the joint venture should operate (e.g., rural only);
- A plan that is outcomes based, rather than just on achieved rollout, such as numbers of sites activated;
- Building relationships with WISPs, including using them for backhaul.

Questions and Discussion

Question: What targets have been set for the active-sharing trials in NSW?

Peter Adams indicated that the trials were testing the commercial arrangements with operators and achieving best value for money for NSW taxpayers. They were not assessed on “money out the door”, although there would always be an expectation on the public service to spend allocated funds to deliver the program’s objectives.

Question: Have you observed a movement of people to regional areas and, if so, how have your plans changed in response?

John Proctor said that RCG had seen a movement of people to rural areas, bringing expectations of urban-style telecommunications in terms of service and connectivity, and sometimes price. The requirements for rural people, he suggested, are now the same as for urban dwellers.

Steve Inglis indicated that the population pressure is now on urban fringes where there are new housing developments but fibre access is not yet available. Users who cannot get service at all or whose service has degraded substantially due to increased demand have been identified. Crown Infrastructure Partners has started a new program for rural capacity upgrades, to offload traffic from mobile towers to fixed networks or WISPs, or to add extra capacity to the towers. New towers do fill up quickly, so a mechanism to manage broadband capacity is needed.

Peter Adams agreed that the urban fringes, such as the trial area near Queanbeyan, provided the greatest challenges for connectivity. He described a “willingness to pay” survey conducted for the NSW government, which had shown that city residents had a greater willingness to pay than others for improved coverage in regional areas: city residents prefer to avoid going in and out of coverage when travelling, whereas it is a “fact of daily life” for regional residents.

Question: Please explain the complementary nature of the service provided by the Mobile Operators and the WISPs.

Steve Inglis described the WISPs as a cost-effective means of providing coverage at the edges of networks. They primarily use Wi-Fi technology in unlicensed spectrum, but they do not support mobile service. In more populated areas, they would have capacity constraints due to interference.

Question: Have the major mobile operators in Australia been open to engaging with the active-sharing trials in NSW?

Peter Adams was cautious in his response, because commercial negotiations were ongoing. He indicated that they had looked at the New Zealand experience and would like to get to an arrangement, as in New Zealand, that was industry-led. The market composition and dynamics in Australia are different, however. He suggested that, as with many other industries, the incumbents would prefer to keep on doing what they are doing. Telstra and TPG, nevertheless, have recently announced a mutual sharing agreement (subject to regulatory approval).

Question: What power solutions are being used in New Zealand?

John Proctor answered that RCG is using local mains power wherever possible. He explained that a tower site is always a compromise between the RF design, the power supply, backhaul costs, and other considerations. Long power lead-ins can be expensive. On the other hand, the installation costs for off-grid power at a large site could be around NZ\$250K.

Steve Inglis noted that diesel generators are used in some cases in the South Island on roads between mountains where solar and wind assets are limited.

In answer to a subsidiary question, John Proctor said that their battery-backup is specified for 8-11 hours of operation. He remarked that RCG's experience was that failures were more often due to backhaul problems, not power backup.

Question: Is there any reason that the New Zealand Rural Connectivity Group model would not work in Australia?

Peter Adams suggested that there were no barriers to adopting this model in Australia, but his current trial will highlight any issues. He reiterated that the market is changing, while commercial issues currently dominate.

In answer to a later question, Peter Adams noted that the issue of continuous corridor coverage is important. For example, new government-funded shared coverage along a road corridor, but then existing single-operator coverage in the towns along the way and at each end would not make sense. The restriction in New Zealand of only using the Rural Connectivity Group model where there is no coverage at all would not work well in Australia.

Question: Is the mobile coverage data in New Zealand now of better quality than it was at the start of the programs?

Steve Inglis considered that it was. Among the evidence is fewer complaints from WISPs that they are being overbuilt. There is greater confidence in the data providers. The large Mobile Network Operators have always provided accurate data but they each measure their signal

strengths slightly differently: this data has had to be “normalised” for the 20 Mbps profile. Crown Infrastructure Partners has also used public sources, initially from Land Information NZ and now also from Core Logic (which provides building outlines as well as land parcel boundaries).

Question: What are the timelines for trials in NSW?

Peter Adams answered that the active-sharing program would kick off on 27 April 2022 and run for just under four months, with milestones along the way. The tender process to build the trial sharing solutions developed would open in Q4 this year (2022).

Question: How do you manage the changes in coverage and capacity over time?

Steve Inglis indicated that Crown Infrastructure Partners’ capacity contracts included monthly reporting on traffic levels, so it is possible to detect and act on hotspots. Upgrades are to provide for the next five years at a minimum. He noted that there has been a shift to working from home during the pandemic; he wondered if there would be a move back to office working, relieving some of the pressure on capacity in the urban fringes.

John Proctor suggested that the capacity problems facing his organization were with backhaul, not spectrum. There needs to be greater emphasis on backhaul issues.

Peter Adams said that his program was anticipating where growth would occur, as well as identifying high-value areas and providing coverage along highways. The program design is informed by and is consistent with other NSW government strategies.

Conclusion

This was the thirteenth of a planned series of forums related to the future of the NBN and a broadband strategy for Australia. Its aim was to describe and compare the approaches adopted in New Zealand and Australia for extending broadband access to rural and remote businesses and residents.

In New Zealand there has been a clear plan to “mop up” the remaining areas without broadband coverage and to provide a minimum standard of 20 Mbps downstream. There has been an active and engaged public-service organization to plan and manage the rollout to unserved areas. As a result, the Mobile Network Operators have responded with a joint venture, which conforms to competition law and other requirements, that can plan, implement and manage the required new mobile networks, in conjunction with Wireless ISPs. The deployments have used the new technology standard MOCN to use spectrum efficiently and to support competitive service provision.

In Australia, telecommunications is largely a Commonwealth issue. The Commonwealth government has rolled out a National Broadband Network (NBN) for fixed broadband access and three major Mobile Network Operators have competitively deployed 4G and 5G mobile broadband. The Commonwealth is continuing to support a Mobile Blackspots program to improve mobile coverage.

Unserved and underserved areas remain. The Forum focussed on one State program to explore and implement commercial and technical solutions to extend broadband coverage to rural areas where it has proved uneconomic to deploy mobile services or where the NBN solution is perceived to be inadequate. While the industry has been moving towards greater sharing of facilities and costs, there has not yet been a cooperative response, unlike in New Zealand, to find shared solutions to network deployments in otherwise uneconomic areas. The State of NSW is supporting, through trials and funding, new competitive and technical models for broadband provision in priority areas, including along unserved highways. While the New Zealand experience is instructive, it is not seen as directly applicable in Australia, due to differences in market conditions and the geography of existing deployments.

The New Zealand model of a continuing series of plans by the government to stimulate and support the deployment of broadband across the country has proved successful. In Australia, with its greater geographical extent and its variety of interests by Federal and State governments, the technical solutions for underserved areas are still being explored and, importantly, the commercial arrangements that will balance competition requirements with economic deployments are yet to fully emerge.

Acknowledgement

The summary of the discussion and the commentary in the Conclusion were written by Leith Campbell.

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Endnote

ⁱ The first forum was held in July 2019 (Campbell & Milner, 2019), the second in October 2019 (Campbell, 2019), the third in February 2020 (Campbell, 2020a), the fourth in August 2020 (Campbell, Smith & Brooks, 2020), the fifth in November 2020 (Campbell, 2020b), the sixth in March 2021 (Campbell, 2021a), the seventh in May 2021 (Campbell, 2021b), the eighth in

August 2021 ([Pritchard-Kelly & Costa, 2022](#)), the ninth also in August 2021 ([Campbell & Mithen, 2021](#)), the tenth in October 2021 ([Waters & Koch, 2022](#)), the eleventh (on 5G trends and developments) in November 2021, and the twelfth (on the Australian Broadband Advisory Council's eHealth report) in March 2022.