

# Regional Mobile Telecommunications Performance

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**Abstract:** Mobile Telecommunications is an essential service that fundamentally affects quality of life by improving communication, the ability of business and industry to improve productivity and for the nation to compete successfully in the global digital economy. There are three fundamental and measurable parameters that, when combined, provide the basis upon which judgements about mobile telecommunications can be made. The parameters are cost, access and performance. Information is readily available about the first two parameters. Quantifiable information is not available about performance. Regional mobile telecommunications is further complicated by factors including population density, the cost of transit or backhaul and infrastructure subsidies. This paper provides a discussion on regional mobile telecommunications performance and focuses on throughput (capacity). The paper recommends that regional mobile telecommunications performance data be collected and that minimum performance standards for regional mobile telecommunications be legislated.

**Keywords:** Telecommunications, Mobile, Broadband, Access, Regulation

## Introduction

Mobile telecommunications is an essential service that fundamentally affects quality of life by improving communication, the ability of business and industry to improve productivity and for the nation to compete successfully in the global digital economy.

There are three fundamental and measurable parameters that, when combined, provide the basis upon which judgements about mobile telecommunications can be made. The parameters are cost, access and performance. This paper focuses on performance and, in particular, throughput (capacity).

Cost includes the capital cost of infrastructure and devices used to connect to the mobile network and the ongoing operational costs including the monthly plan charges. For consumers, the cost of the mobile network plans is readily available on the mobile network operator websites.

Access is being able to connect to the mobile telecommunications network at home and at work and with the requisite knowledge to utilise the applications and services (especially government services) provided over the mobile telecommunications network ([Infrastructure Australia, 2020](#)). Access also includes service reliability and other impacts that might reduce access. Mobile network operators provide coverage maps on their websites.

Performance is being able to reasonably utilise mobile telecommunications for voice and video calls and to utilise applications and services over the Internet utilising mobile telecommunications broadband data. Measures which can be used to assess performance in mobile telecommunications networks include upload and download speeds, ping time, latency, jitter and packet loss, application processing time, transit link delay, amongst others. Mobile telecommunications performance will vary due to a variety of technical and non-technical factors, such as access network and backhaul capacity, distance from towers, carrier frequency, technology employed, content delivery networks, terrain, weather, and network congestion.

In Australia every three years, the Government appoints the Regional Telecommunications Independent Review Committee (RTIRC) to conduct a review into regional telecommunications in regional, rural and remote parts of Australia ([RTR, 2021a](#)).

Complaints about mobile telecommunications in regional, rural and remote areas of Australia gain media coverage, but achieving outcomes based on the complaints can be difficult, particularly related to performance ([Richards, 2020](#); [Smith, 2021](#); [Herrmann, 2021](#); [Mills, 2021](#); [Ward & Schremmer, 2021](#)).

In 2018, the RTIRC Report titled *2018 Regional Telecommunications Review – Getting it right out there* ([Edwards et al., 2018](#)) made the following recommendations related to cost, access and performance:

1. Cost. Recommendations 3, 8, 9.
2. Access. Recommendations 1, 2, 4, 7, 8, 10.
3. Performance. Recommendation 6.

On 2 June 2021, the Government announced ([Coulton, 2021](#)) the RTIRC to undertake the 2021 RTR and provided the Terms of Reference (ToR) ([RTR, 2021b](#)).

A review of the eight ToR sections related to cost, access and performance indicates:

1. Cost. Sections 1, 4, 5.
2. Access. Sections 1, 2, 4, 5.
3. Performance. Sections 1, 4.

Sections 1 and 4 contain generic references to performance that do not identify requirements for data, nor tangible performance outcomes. Sections 1, 6, 7 and 8 relate to the requirement for the committee to carry out public consultations and consultations with people in regional, rural and remote parts of Australia (Section 3), the requirement for a report (Section 6) containing recommendations to the Australian Government, a requirement for the committee to assess the costs and benefits when formulating recommendations (Section 7), and the report submission deadline of 31 December 2021 (Section 8.)

## Performance Measures

In this section several factors affecting regional mobile telecommunications performance are discussed. For the consumer, cost, coverage and connection speeds are the three factors that are most visible either through the mobile network operator websites or through media advertising ([Ward, 2021](#); [Bushell-Embling, 2020](#); [Fletcher, 2021](#); [Waring, 2021](#)). Advertising related to the performance of mobile networks has, on occasion, been found to make representations that have ended up in court ([Reichert, 2018](#); [Arboleda, 2018](#); [Wilkinson, 2020](#)).

### Coverage and connection speeds

To gain an understanding of “real-world” coverage and connection speeds it is necessary to read the legal risk mitigation disclaimers provided by the mobile network operators. Often, the disclaimers cover more than one of the mobile network technologies, affording the opportunity to do a comparison. In an online statement about Telstra 4GX, the carrier states ([Telstra, 2021a](#)):

“The Telstra Mobile Network offers 4GX in all capital CBDs and selected suburban and regional areas and is progressively rolling out to more places. In other coverage areas around Australia you’ll automatically switch to our fastest available 4G or 3G. Check coverage at [telstra.com/coverage](#).

In 4GX areas, typical download speeds are 2-75Mbps for 4GX category 4 devices, 2-100Mbps for 4GX category 6 devices and 5-150Mbps for 4GX category 9 devices.

With a Telstra 4G device in 4G areas, typical download speeds are 2 – 50Mbps.

Speeds vary for reasons like location, distance from base stations, terrain, user numbers, hardware/software configuration, download source and upload destination. To check the coverage and available speeds in your area, see our coverage.”

There are two points of interest made in this statement. The first is that Telstra identifies download connection speed ranges for phone categories. Secondly, the low end of the

connection speed range starts at 2 Mbps irrespective of the mobile technology and phone category. The statement does not provide connection speeds for typical scenarios, e.g., standing outside on a clear or cloudy day 500 m from and with clear sight of a mobile base station.

It is important to note that the statement found on the Telstra website is being used as a guide in this paper for two reasons. First, Telstra states that “we cover more than 2.5 million square kilometres – that’s 1 million square kilometres more than any other network” (Telstra, 2021b). Secondly, Telstra is the largest carrier and currently it is the Universal Service Obligation (USO) (USO, 2021) provider. Telstra’s statement is indicative of the language provided by carriers regarding mobile telecommunications access and typical download speeds.

## Location and processing times

It should be noted that application processing time, which is the time taken by an application to process a message after receiving it and to send a response, is a factor under the control of the carriers and the third-party companies that provide the applications and services, but that, for clarity of this paper, this discussion is beyond the scope of this paper.

Another factor that should be considered affecting regional mobile telecommunications performance is the location of the data centres that host most of the applications and services (including content) accessed by end users. A survey of the literature, including online, journals and conference papers, government sources and company documents, did not find any studies that identify the number, distribution or location of the applications and services accessed by mobile telecommunications users.

Streaming media providers have been quick to utilise content distribution network providers and have provided carriers with proxy servers. This has helped with reducing the complaints sent to the Telecommunications Industry Ombudsman (TIO) about buffering and poor performance.

The number of applications and services hosted in data centres in Sydney, Melbourne and overseas is unknown; however, it is reasonable to assume that most of the content is hosted there.

Application performance related to number, distribution, location and processing times is measurable, and, if this was done, the information gathered would have substantial value, when it is combined with other measures, to customers because it would provide more information that they can use when they choose their mobile plan.

Detrimental performance can occur due to distance to the data centres (latency), the available network capacity provisioned onto the transit (backhaul) links, and the capacity provisioned to each of the mobile base stations.

A mechanism to alleviate performance degradation due to latency and packet loss is to ensure that there is sufficient network capacity. A secondary, but also important, mechanism to improve mobile telecommunications performance is to distribute the applications and services closer to end users, e.g., at edge data centres.

## Discussion

### Performance studies

A survey of the literature including online, journals and conference papers, government sources and industry sources did not uncover any rigorous studies into the performance of mobile telecommunications in regional, rural and remote areas of Australia. Discussion related to regional mobile telecommunications performance has occurred in the RTR reports, but only in the context of more needs to be done to improve performance ([RTR, 2021a](#)).

Infrastructure Australia ([2020](#)) has also identified that more needs to be done about mobile telecommunications coverage and performance in regional and remote areas. In an early-stage proposal (stage 1) on *Mobile telecommunications coverage in regional and remote areas*, Infrastructure Australia states that the proposal is to “improve the availability and quality of mobile services in certain regional and remote areas”. The proposal does not appear to have moved forward with the next step identified as “Proponent(s) to be identified”.

Telecommunications performance is often measured and compared using connection speed tests conducted by users on third-party testing sites ([Ookla, 2021](#)). The carriers themselves often also provide access to the third-party connection speed test tools ([Telstra, 2021c](#)). However, since most of the applications, services and content required by users is not hosted on the carrier networks but in data centres located in Sydney, Melbourne and overseas, third-party organisations that connect to or operate content delivery networks can provide a more representative result. The third-party organisations, such as Ookla and the crowd-sourced OpenSignal, provide a generic insight into one aspect of mobile telecommunications performance, which is the latency and upload and download speeds between the end-user device and the server hosting the speed test application.

Whilst the generic connections speed tests do not provide a comprehensive measure for mobile telecommunications performance, they do provide a valuable but limited insight.

For example, the Telstra mobile network connection speed tests in Western Australia are carried out between end-user devices and the application servers located in Perth. If the vast majority of applications and services are located in data centres in Melbourne, Sydney and overseas, what effect does the transit link from Perth to the data centre have?

The mobile network connection speed test servers appear to be located in the capital cities in each state and territory. This provides an opportunity for the following equity related questions to be answered:

1. Are the mobile network connection speeds and latency consistent between states and territories?
2. Are the mobile telecommunications connection speeds and latency experienced in regional, rural and remote areas of Australia similar to that in urban areas of Australia?
3. What is the latency for each of the interstate and territory transmission links?

## Access

In 2015, I argued for a universal access regime in the paper titled *The Rationale for Universal Access to Digital Services* ([Gregory, 2015](#)) that enshrines the principal of “ensuring that federal, state and local government and other specified digital services are reasonably accessible to all, on an equitable basis, wherever they work or live”.

The principal of universal service upon which the proposed universal access regime is based is a long-standing consumer protection that ensures everyone has access to landline telephones and payphones regardless of where they live or work ([USO, 2021](#)). There is an understanding that the performance of the landline telephones and payphones covered under the USO would meet industry standards and guidelines and be similar, irrespective of where the infrastructure is located. The performance criteria to be met by the current USO provider, Telstra, for fixed-line and payphone standards and benchmarks are contained in the Telecommunications (Consumer Protection and Service Standards) Act 1999 (TCPSS Act) ([TCPSS, 2020](#)).

Section 115 of the TCPSS Act provides for the required performance standards and subsection 115(1) states that the Australian Communications and Media Authority (ACMA):

“may, by written instrument, make standards to be complied with by carriage service providers in relation to:

- (a) the making of arrangements with customers about the period taken to comply with requests to connect customers to specified kinds of carriage services; and

- (b) the periods that carriage service providers may offer to customers when making those arrangements; and
- (c) the compliance by carriage service providers with the terms of those arrangements; and
- (d) the period taken to comply with requests to rectify faults or service difficulties relating to specified kinds of carriage services, where the rectification follows the making of a customer report about a fault or service difficulty; and
- (e) the keeping of appointments to meet customers, or representatives of customers, where the appointment relates to:
  - (i) a connection of a kind covered by paragraph (a); or
  - (ii) a rectification of a kind covered by paragraph (d); and
- (f) any other matter concerning the supply, or proposed supply, of a carriage service to a customer.”

Section 117B of the TCPSS Act provides for performance benchmarks and subsection 117B(1) states that “the Minister may, by legislative instrument, set minimum benchmarks in relation to compliance by carriage service providers with a standard in force under section 115.”

Following deregulation of the Australian telecommunications market in the 1990s, the focus has been on access to telecommunications and the government has facilitated ‘Black Spot’ programs ([Australian Government, 2021](#)) to provide government funding to mobile telecommunications carriers to build infrastructure in areas of need that might not otherwise be covered.

It is arguable that access and the cost of providing access has been somewhat quantified and government, government agencies and the carriers have the information necessary to make justifiable decisions related to the provision of access, sometimes at taxpayer expense.

## Utility

It is possible for cost to be reasonable and access to be available but for the utility of mobile telecommunications to be poor.

For example, in 2018, I proposed four options for the future ownership of NBN Co beyond 2022, when the National Broadband Network (NBN) is expected to be built and fully operational ([Gregory, 2018](#)). What that paper did not address was what performance users of the NBN should expect before or after the NBN completion date, and this question highlights



the similarity between the NBN and mobile telecommunications, particularly when it comes to the question of utility.

The Australian Competition and Consumer Commission (ACCC) commenced a Measuring Broadband Australia (MBA) program to monitor the NBN connection speeds and latency in 2018, eight years after the NBN rollout commenced ([ACCC, 2021](#)). In the years prior, a rising number of complaints about NBN connection performance from advocates and consumers convinced government to fund the ACCC program, and this program has now been extended for a second term until 2025.

In a review of the program, the ACCC reported ([ACCC, 2021](#)) that the program is the “only independent source of reliable broadband performance information” and that:

“The Measuring Broadband Australia program is an important component in furthering the Government’s priority to facilitate consumer access to affordable and reliable communications services, irrespective of where consumers live or work. It is also a key element of the ACCC’s integrated strategy for improving competition and consumer outcomes in broadband markets, along with our Broadband Speed Claims guidance and enforcement actions. This approach has successfully assisted in the delivery of improved market outcomes for consumers of high speed broadband services.”

The ACCC states that “the MBA program is a light touch, market based measure that increases competitive pressure on RSPs to deliver the performance they represent to the market”. The ACCC argues that this light-touch approach has led to a decrease in the number of underperforming services and an increase in download speeds of monitored services.

The ACCC draws upon the support of regional, rural and remote consumer advocate groups that expressed in 2018 strong support for the program and for it to be extended to cover NBN fixed wireless and satellite services ([Edwards \*et al.\*, 2018](#)).

Whilst the MBA program has only been partially successful in achieving improved connection speed and latency for NBN fixed access customers, the alternative, no MBA program, would be unimaginable to consumer advocates. In other words, the data that the MBA program has provided has been vital in the effort to improve NBN performance and consumer outcomes.

The outcomes have been promising but limited by the “light-touch” approach adopted by the ACCC and the failure of government (1) to acknowledge the mistake to shift from FTTP; and (2) to mandate a rapid rollout of FTTP to 93 per cent of premises.



The question remains, what will the minimum performance be for NBN consumer connections when the MBA program ends in 2025, or will government be forced to continue to fund this program indefinitely?

The cost of mobile telecommunications for users in regional, rural and remote areas of Australia is equitable with the cost for users in urban areas. The tier one Australian mobile network operators offer mobile plans consistently to all consumers, irrespective of where they live or work.

From a consumer perspective, mobile telecommunications performance is about the utility of mobile telecommunications to successfully carry out voice and video telephone calls and to be able to fully utilise applications and services over the Internet utilising mobile telecommunications broadband data.

## Preliminary Study

There is an identifiable lack of data related to regional mobile telecommunications performance. Without quantifiable data, government is not able to formulate reasonable policy and regulations.

Consumers can, of course, complain to the TIO about the performance of their mobile telecommunications service; however, without an objective measure of what constitutes acceptable 'performance', it is challenging for the TIO to act. Further, the number of complaints about regional mobile services is low when compared to the number of overall complaints about the NBN. This is to be expected when the number of people living and working in regional, rural and remote areas is significantly smaller than the number of NBN subscribers.

Due to deficiencies in the data available from the TIO, it is difficult to identify TIO complaint figures related to regional mobile telecommunications and it is therefore problematic to refer to TIO data outputs ([TIO, 2020](#)) when discussing the state of regional mobile telecommunications.

To investigate the issue, a preliminary study of regional mobile telecommunications performance was carried out during July and August 2021 in South Australia, Northern Territory and Western Australia. The Telstra mobile network was used for the connection speed and latency tests for two reasons: (1) availability of a 3G/4G/5G phone connected to the Telstra network; and (2) in many areas traversed, the only provider is Telstra.

It is important to identify that this was an exploratory study and the results are not rigorous and therefore not suitable for publication. The purpose of the exploratory study was: (1) to

follow up on a number of requests that were received for regional mobile telecommunications performance to be investigated; and (2) to identify if a rigorous study should be carried out.

Connection speed and latency tests were not carried out in every location traversed due to the time available.

There were three high-level outcomes identified from the exploratory study:

1. Across all regional areas studied, the average connection speeds were between 0-10 Mbps download and 0-2 Mbps upload.
2. Most small cells near mining sites had download and upload connection speeds above 20 Mbps.
3. Connection speeds in more than five major regional centres in Western Australia were between 0-10 Mbps download and 0-2 Mbps upload.
4. Connection speeds greater than 50 Mbps download and 20 Mbps upload were only achieved in Perth and Kalgoorlie.

In all cases, the measurements were taken with clear line of sight to the mobile base stations, on a clear or cloudy day and with the distance to the mobile base stations of between 500 m to 750 m. Other measurements were made and are not referred to here, such as measurements made whilst in transit; however, none of these measurements were inconsistent with the performance observed.

## Discussion

It is my view that, based on the outcomes of the preliminary study, there is an urgent need for a rigorous study of regional mobile telecommunications performance. This study should include connection speed and latency tests, transit latency and capacity, and number, distribution, location and processing times of applications and services utilised by regional mobile telecommunications users (particularly government digital services).

As with the NBN, there is an urgent need for the ACCC to develop minimum mobile telecommunication service expectations that go beyond the flawed “light-touch” approach that is currently in favour at the ACCC for NBN services.

When the MBA program ends, there could be a reversion of NBN connection performance to a previous state that is detrimental to consumers. Also, the ACCC does not have a full and clear understanding of factors affecting performance, as it does not appear to be considering the parts of the networks beyond the access network.

The Australian mobile telecommunications industry is self-regulated. To improve customer outcomes the government should direct the Australian Communications and Media Authority (ACMA) to work with the industry peak body, Communications Alliance, to develop an

industry standard covering mobile telecommunications performance that includes standard scenarios, connection speeds and capacity.

## Domestic Mobile Roaming Declaration

An ACCC domestic mobile roaming declaration inquiry was completed on 23 October 2017 ([ACCC, 2017](#)). The inquiry outcome was a decision by the ACCC to not declare domestic mobile roaming. The ACCC stated that it was “not satisfied that declaration would promote the long-term interests of end-users”. The ACCC released a paper titled *Measures to address regional mobile issues* that contained proposals for “a number of measures to improve mobile services in regional areas”.

The rationale for the ACCC decision was fundamentally flawed. The proposals related to performance identified in the ACCC paper do not appear to have been achieved, and a review has not identified an ACCC work program that will lead, in a reasonable time, to the proposals being achieved.

In the years since this decision, the disparity between the Telstra regional mobile telecommunications network and the competitor networks appears to have increased ([Telstra, 2021b](#)), Telstra continues to attract the majority of Black Spot funding from the Federal and State governments ([Telstra, 2021d](#)) and there does not appear to have been a substantive change in the amount of regional Australia that is covered by more than one mobile network operator.

The ACCC paper states that “there is a need for better transparency about network coverage, quality, expansions and improvements”, yet this does not appear to have occurred. The ACCC paper also states that “network coverage and quality information is inaccurate and lacks transparency”.

The ACCC paper provides strong and justifiable arguments for a declaration of domestic mobile roaming to be made, yet the “light-touch” ideology that appears to be in favour at the ACCC means that the declaration was not made in 2017.

On 22 February 2018, the ACCC hosted a forum ([ACCC, 2018](#)) with stakeholders to discuss the issues raised in the *Measures to address regional mobile issues* paper. The summary of findings from session 1 includes the statement that “improvements are needed in the provision of accurate, comparable and reliable information on the quality and extent of mobile coverage”.

The mobile network operators provide coverage maps on their websites and, whilst the coverage maps cannot be replicated with the information available, it is possible to gain an insight into the “extent of mobile coverage”.

“Accurate, comparable and reliable information on the quality” of mobile coverage does not appear to be available in any form. It does not appear to be available on the mobile network operator websites, nor does it appear to be available from the ACCC or any other government agency.

The only information available on the mobile network operator websites appears to exist in disclaimer form, as if to ensure that performance, whether poor, reasonable or good, is covered by a legal risk mitigation statement.

For example, Telstra’s website ([Telstra, 2021a](#)) contains the statement “with a Telstra 4G device in 4G areas, typical download speeds are 2 – 50Mbps” and “[i]n 4GX areas, typical download speeds are 2-75Mbps for 4GX category 4 devices, 2-100Mbps for 4GX category 6 devices and 5-150Mbps for 4GX category 9 devices.”

If urban mobile telecommunications users were experiencing mobile telecommunications download speeds sub-10 Mbps for long periods of time, as it appears to be the case in regional, rural and remote areas as identified in the exploratory study mentioned earlier, it would be assumed that there would be a significant rise in complaints via the TIO and the problem would become a prime-time media topic.

It is also remarkable that the ACCC permits the mobile network operators to boast of “amazing” download speeds, up to 1 Gbps for 5G, yet the ACCC does not require the mobile network operators to temper this marketing hype with information on typical speeds achieved for a range of standard scenarios, e.g., (1) time of day, (2) location, and (3) standing or walking within clear sight and 500 m of a tower on a clear or cloudy day.

This begs the question: when will action be taken to secure the data needed to generate “accurate, comparable and reliable information on the quality” of regional mobile telecommunications?

One positive outcome that a declaration of domestic roaming in regional, rural and remote areas would have is an improvement in performance, because it is assumed that (1) the other carriers would want minimum performance standards to be set to reduce the likelihood of complaints, and (2) an increase in the number of mobile telecommunications users in regional, rural and remote areas, thereby increasing the number of complaints when poor performance occurs.

## Recommendations

The following recommendations are made:

1. Federal government funding should be made available for an academic study of regional mobile telecommunications performance to be carried out or for funding to be provided to the ACCC for the MBA program to be extended to regional mobile telecommunications.
2. The Federal government should legislate minimum performance standards for regional mobile telecommunications.
3. The Federal government should require the ACMA to work with Communications Alliance to prepare an industry standard on mobile telecommunications performance.
4. Regional mobile telecommunications performance should be the same as urban mobile telecommunications performance for government applications and services.
5. The ACCC should declare domestic mobile roaming for regional mobile telecommunications for a period of three years.

## Conclusion

This paper discusses regional mobile telecommunications performance and identifies the urgent need for data to be collected that will permit the current state of regional mobile telecommunications to be ascertained. The imbalance in the provision of mobile telecommunications in regional, rural and remote areas, and the lack of follow through on data collection, provide strong justification for the ACCC to declare domestic mobile roaming for a period of three years. The lack of legislated minimum performance standards for all telecommunications in Australia means that consumers can experience sub-standard performance, and this is especially evident for regional, rural and remote mobile telecommunications users. This situation must be rectified by the Federal government and minimum performance standards for telecommunications should be legislated. Regional mobile telecommunications users need relief, and there must be a realisation that minimum performance standards and expectations for urban and regional, rural and remote users should not differ.

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