Broadband performance monitoring and reporting in the Australian context

Consultation paper

14 August 2013

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1   Overview

The ACCC is considering the implementation of a monitoring and reporting program in relation to the performance of broadband internet services in Australia, subject to securing financial support.

A broadband performance monitoring and reporting program would involve testing data transfer rates and other quality of service metrics for broadband services. The ACCC would then compile the resulting data and publicly release reports discussing the results.

Similar programs have been implemented in a number of international jurisdictions including the UK, US, Singapore and New Zealand. These programs are outlined in further detail in section 3 and throughout this paper.

The purpose of this consultation process is to enable the ACCC to develop a plan for a robust monitoring program which would provide meaningful and insightful reporting for stakeholders on the performance of broadband services in Australia. The ACCC is seeking to engage closely with industry and consumer groups (and any other relevant stakeholders) on the appropriate testing methodology, scope, quality of service metrics and reporting framework for the proposed program. These are discussed in section 4.

The ACCC considers that a broadband monitoring and reporting program would encourage competition and efficient investment in infrastructure in the Australian broadband market as well as providing significant benefits for consumers. However, the scope and nature of any program, if implemented, will depend upon technical and budgetary considerations.

Following this consultation process, the ACCC intends to release a position paper in 2014 outlining how it would implement a broadband performance monitoring and reporting program if the necessary funding was obtained.

1.1 Why is the ACCC considering this program?

In the last 10 years there has been a significant increase in the demand for high quality broadband services in Australia, which has been fuelled by the development of new devices and attractive service offerings by internet service providers (ISPs). There were 12.2 million internet subscribers in Australia at the end of December 2012, with almost 98 per cent of these subscribers acquiring a broadband service.[1]

Broadband services are high speed, always-on internet services provided over a wide range of technologies. In Australia, broadband services are provided over copper (ADSL and VDSL), hybrid fibre-coaxial cable (HFC or cable), optical fibre, wireless (mobile and fixed) and satellite networks.

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[1] Australian Bureau of Statistics, 8153.0 Internet activity, Australia, December 2012.

In 2009, NBN Co was created to roll out the National Broadband Network (NBN). The aim of the NBN is to improve the availability of broadband services to the Australian public regardless of where they live.[2] This infrastructure project recognises the increasing significance of broadband services in the lives of consumers.

As broadband services become more widely available through the NBN rollout, and as demand for higher data transfer rates (commonly referred to as 'speeds') increases, the ACCC expects that the quality of broadband services will become more and more important for consumers.

The ACCC has also previously raised concerns regarding the marketing of broadband services, particularly around the use of potentially misleading headline claims by ISPs. The ACCC has investigated a range of claims about the performance of both fixed-line and mobile broadband services. In addition, the ACCC published industry information papers setting out the ACCC's position on the marketing of ADSL, mobile broadband and HFC/optical fibre services in 2007, 2009 and 2011 respectively.

1.2 What are the likely benefits for stakeholders?

1.2.1 Consumers

A broadband performance monitoring and reporting program could provide transparency to consumers about the performance of broadband services available in Australia.

To date, ISPs have competed largely on the basis of price, headline speeds and download quotas. While some information on service quality (e.g. average data transfer rates, reliability) is available for mobile broadband services, this information has not been as freely available for consumers of fixed-line broadband services.

Information on the real-world performance of broadband services is important to enable consumers to choose the right service for their needs—whether acquiring a new service or considering renewing an existing service.

Service quality between different networks can vary significantly. For example, two ISPs may offer a plan at the same price point with the same amount of data but if one provider has invested heavily in network capacity while the other has not, the end-user's experience is likely to be significantly different with each ISP.

The ACCC considers that competition works best when consumers are informed and can make the right choices for their needs. Comparison data would not only serve to help consumers choose the 'fastest' or 'most reliable' service but would also enable consumers to weigh up their needs and budget to make an appropriate cost/performance decision.

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[2] DBCDE, Statement of Expectations, 17 December 2010 (http://www.dbcde.gov.au/__data/assets/pdf_file/0003/132069/Statement_of_Expectations.pdf). See also: http://www.nbnco.com.au/about-us/our-purpose.html.

In addition, a testing program would provide protection to consumers by holding ISPs accountable for any performance claims, including headline speed claims. This could be achieved by making consumers aware of the real-world performance of a particular ISP which they could then compare against the claims being made, as well as providing the ACCC with data which would enable it to assess whether certain claims may be misleading and/or deceptive under the Australian Consumer Law.[3]

The ability to differentiate services based on quality may also lead to an increase in overall investment in capacity by ISPs and improved services for consumers as a result. Experiences in other jurisdictions suggest that service performance for individual ISPs with poor testing results in one reporting period has improved significantly the next reporting period.

1.2.2 Internet service providers

A broadband performance monitoring and reporting program would give ISPs access to information on the real-world performance of their services and their competitors' services, enabling them to better differentiate their services in a way which is open and transparent.

Specifically, the proposed program would allow ISPs to differentiate their products and services from their competitors based upon the results of the ACCC's testing results. For example, an ISP could advertise that its service offerings represent greater value than those of an ISP with similar network performance. This would draw out an extra competitive dimension in addition to price and download quotas.

The ACCC recognises that many ISPs and network operators have been or are beginning to roll out additional fixed and mobile broadband infrastructure and increase capacity in order to address capacity constraints, increase functionality and improve consumer experiences. In this regard, the ACCC considers a broadband performance monitoring and reporting program would reward ISPs for these investments by drawing consumer attention to improvements in service quality and allow them to more readily substantiate any performance claims across their service offerings.

The proposed program would also allow ISPs to identify potential service quality issues which they could in turn raise with their network operator. Further, in some cases the ACCC could use test results to 'triangulate on' an issue within an access network. For example, if the ACCC observed poor performance from all ISPs supplying NBN-based services in a specific area, this would likely indicate an issue at the wholesale access level rather than the ISP level. While ISPs are ultimately responsible for ensuring they deliver performance outcomes in line with their retail product marketing, the ACCC would take into account any failures to deliver promised performance by network operators when analysing data and preparing reports. In addition, if there was evidence of a network operator over-promising and under-delivering the ACCC could consider enforcement action for misleading or deceptive conduct and/or for failure to comply with any applicable regulatory determinations.

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[3] Schedule 2 of the *Competition and Consumer Act 2010*.

1.2.3 Testing companies

Information technology companies (referred to throughout this paper as 'potential testing companies') could also benefit from being involved in an Australian broadband performance monitoring and reporting program.

There would be potential for the company administering any program implemented by the ACCC to offer additional services to ISPs. For example, the testing company could provide individual ISP testing, based on the ACCC's testing methodology, on the performance of certain services so as to allow the relevant ISP to substantiate particular performance claims.

1.2.4 End-user volunteers

Under the ACCC's proposed testing approach (discussed in section 4.1 below), the ACCC would be relying on consumers across Australia to volunteer their broadband service for testing.

In addition to assisting the ACCC with administering the proposed program, volunteers would likely be provided with software which allows them to check the performance of their own connection. This would enable volunteers to evaluate the performance of their service on a regular basis and determine the adequacy of the service for their needs.

The testing program would be designed to ensure that volunteers' privacy is maintained and would not record private internet traffic. The identity of volunteers would not be disclosed. Similarly, the program would be designed so that volunteers are not inconvenienced by the running of tests across their service. The testing equipment would require minimal electricity and would likely run tests only when the user is not using their connection (testing units deployed internationally can conduct tests in very small 'connection inactive' windows such as between clicks when a user is browsing the internet).

2   Consultation process

The ACCC is seeking submissions from a range of stakeholders including industry and consumer groups on the specific questions raised in this consultation paper, but invites comments on any other matters relating to the introduction of a broadband performance monitoring and reporting program in Australia.

All submissions to this consultation paper will be considered public and posted on the ACCC's website. If you wish to provide commercial-in-confidence material to the ACCC, a public version should also be provided. The public version should clearly identify the commercial-in-confidence material by replacing the confidential material with '[c-i-c]'.

The ACCC and AER general policy on the collection, use and disclosure of information is set out in the *ACCC-AER information policy: the collection, use and disclosure of information*. A copy of the guide is available on the ACCC website.

The ACCC prefers to receive submissions in electronic form, either in Adobe PDF or Microsoft Word format which allows the text to be searched.

Submissions will be accepted **until 5:00 pm on Friday, 13 September 2013**. Submissions received after this time may not be considered.

Please forward submissions to: BroadbandPerformance@accc.gov.au

For further information, please contact: Rebecca Larsen (03) 9290 1939.

3 International broadband performance monitoring and reporting programs

Broadband performance monitoring and reporting programs have been implemented by a number of international regulators including in the UK, US, Singapore and New Zealand.

In 2008, Ofcom commenced a research program into the performance of fixed-line broadband services delivered to UK residential consumers. Ofcom currently monitors ADSL, HFC and fibre-to-the-cabinet (FTTC)[4] services.[5] The purpose of the program was to identify average actual download throughput speeds, along with a number of other metrics, to determine the consumer experience with broadband services.

Ofcom's Chief Executive, Ed Richards, stated in 2011 that the UK broadband market had been transformed since Ofcom published its first report in early 2009.[6] One of the results of the research is that consumers are increasingly moving towards higher rated services and enjoying faster speeds as a result of greater access to broadband performance information. In 2012, Mr Richards reiterated that "Internet providers are working to meet consumer demand through network upgrades and the launch of superfast packages, giving consumers faster speeds and greater choice".[7]

In 2011, the Federal Communications Commission (FCC) released the first 'Measuring Broadband America' report which outlines the results of a nationwide study of actual residential fixed-line broadband performance in the US.[8] This study arose as a result of the National Broadband Plan recommendation that the FCC obtain and publicly release detailed and accurate measurements of consumer broadband performance. The FCC monitors ADSL, HFC, and fibre as well as satellite services. The FCC has indicated an intention to report on fixed wireless services in the future.[9]

The FCC's Measuring Broadband America program focusses on throughput speeds experienced by consumers in peak or 'busy' periods. Since it began, the FCC has observed that ISPs have improved in both their ability to deliver what they promise to

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[4] The specific technology used for providing these services is generally VDSL.

[5] Ofcom does not monitor fibre-to-the-home (FTTH) or satellite services as these services represent only a small proportion of the total broadband market in the UK (http://stakeholders.ofcom.org.uk/market-data-research/other/telecoms-research/broadband-speeds/).

[6] http://consumers.ofcom.org.uk/2011/07/consumers-benefit-from-uk-broadband-speed-surge/

[7] http://media.ofcom.org.uk/2013/03/14/average-uk-broadband-speeds-hit-double-figures/

[8] http://www.fcc.gov/measuring-broadband-america

[9] The FCC obtains the data for ADSL, HFC, fixed wireless, satellite and fibre services. To date, the FCC has not reported on fixed wireless due to a lack of volunteers acquiring these services.

customers and in the overall speeds that they can and are delivering.[10] The FCC has stated that it has seen significant investment by ISPs in their networks and the gap between advertised and actual speeds has narrowed.

Singapore's Infocomm Development Authority (IDA) commenced its 'Consumer Broadband' program in 2011. The Consumer Broadband program is designed to provide consumers with information to enable them to compare different ISPs' broadband services. The IDA provides information to consumers on the performance of services as well as pricing in the form of interactive charts on its website.[11]

The New Zealand Commerce Commission (NZCC) commenced an annual monitoring and reporting program in 2012.[12] The NZCC monitors ADSL, HFC, FTTH and FTTN/VDSL. The NZCC has not yet produced a report on the results of the program, though its contractor TrueNet releases a brief broadband performance report each month. The NZCC has indicated the study will be more oriented towards measuring the kind of performance that is delivered to consumers compared to research undertaken for previous reports on broadband performance quality (which appear to have been highly aggregated).

The ACCC considers that these international experiences provide some insight into how a broadband performance monitoring and reporting program could be implemented in the Australian context.

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[10] FCC, 2012 Measuring Broadband America: July Report – A report on consumer wireline broadband performance in the US, July 2012, page 49.

[11] http://www.ida.gov.sg/applications/rbs/chart.html

[12] http://www.comcom.govt.nz/media-releases/detail/2012/commerce-commission-selects-truenet-to-test-broadband-quality

4 Broadband performance monitoring and reporting in Australia

An Australian broadband performance monitoring program which is credible and robust would require careful design and implementation. If the relevant stakeholders, including ISPs and consumers did not have faith in the accuracy of the program, they would be unlikely to constructively engage with the results it produced.

The ACCC is, therefore, seeking views on the following aspects of the proposed program:

- the testing methodology
- the scope of testing
- which performance metrics should be tested
- how the results of the testing should be reported.

There are some aspects of the consumer broadband experience which would fall outside the scope of this program. For example, the ACCC does not propose to monitor or provide information on broadband pricing or individual consumer broadband service performance. Rather, the focus would be on providing high level information to consumers on the performance of particular ISPs and broadband networks.

It is also important to note that there are other factors which may affect individual consumer broadband experiences which would not be captured by the program. For example, consumers may experience slow data transfer rates for certain websites or when trying to access certain content servers. The use of several devices over a connection, poor configuration of residential wireless gateways and slow devices (e.g. computers) or networking equipment (e.g. modem/routers) may also have an effect on an individual consumer's broadband experience.
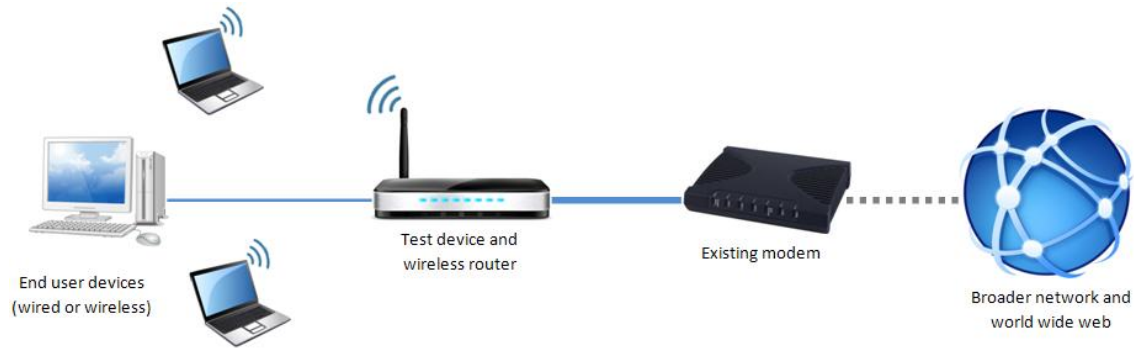
4.1 Testing methodology

There are a number of ways to test broadband performance. These include probe-based, laboratory and software-based testing. The ACCC considers that a probe-based testing methodology would be most appropriate in the Australian context.

Probe-based testing has been adopted in the UK, US, Singapore and New Zealand. This approach requires the recruitment of volunteers acquiring fixed-line broadband services. A sample is then chosen from the pool of volunteers to ensure that the results are representative of the market segments being tested (e.g. region, service technology). Each market segment requires a threshold number of volunteers to be monitored to ensure that the data is reliable.

Volunteers are provided with hardware monitoring units (HMUs) which contain software which is programmed to run periodic tests on various aspects relating to the

performance of the service. HMUs may be installed at various points on the end-users' connection. However, the most likely position is between the end-user's router or modem and their residential network. This allows the HMU to determine when the network is free to run tests—thereby avoiding disrupting the end-user's personal use. Below is a diagram outlining where the HMU may be located in the broadband service supply chain.[13]

End user devices
(wired or wireless)

Test device and
wireless router

Existing modem

Broader network and
world wide web

The HMUs being used in other jurisdictions do not log private internet traffic and the identity of volunteers is not disclosed to ISPs. This ensures the privacy of volunteers and avoids the manipulation of testing results by ISPs. Furthermore, the HMUs require only a small amount of the volunteers' data quotas. [14]

Probe-based testing generates large amounts of data. In the UK, for example, HMUs are scheduled to run over 14,000 tests over the course of a day.[15] The probe is configured to behave like an end-user performing a range of normal tasks using their internet connection (e.g. browsing websites, sending/receiving emails, watching online videos, making internet phone calls). In doing so, the probe measures a range of variables which directly impact upon the real-world end-user service experience. As a result, the probe-based approach can produce a quality and quantity of data that supports detailed analysis and reporting.

Software-based tests can be conducted in a number of ways and may involve downloading and installing testing software on a volunteer's device (PC, laptop or smartphone) and using this software to run periodic tests. Alternatively, software may be used to run 'passive network tests' to monitor traffic over the network. There are limitations with software-based testing due to factors unrelated to the quality of the service provided by the ISP, which may adversely affect the results. For example, the

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[13] In the illustrated example the HMU includes wireless router functionality. This is not mandatory—if an end-user wanted to continue using their own equipment the HMU could sit in between the modem and the end-user's existing wireless router.

[14] In the US, program participants with data quota restrictions can have their tests set to run less frequently.

[15] Ofcom, UK fixed-line broadband performance, November 2012: Research Report, page 51 (available at http://stakeholders.ofcom.org.uk/market-data-research/other/telecoms-research/broadband-speeds/broadband-speeds-nov2012/).

capabilities and configuration of the volunteer's device or the number of devices the volunteer has connected to the network.

Laboratory testing involves setting up laboratories at sites across the country to conduct tests. However, this approach involves high set-up costs and an increased risk of ISPs and network providers manipulating the results by providing services of a higher standard to testing areas.

The probe-based approach has generally been supported by ISPs involved in the abovementioned international programs because it produces more reliable and accurate data than other options. However, the ability to compare the performance of services and particular ISPs is impacted by the ability to acquire a sufficient number of volunteers to allow for meaningful statistical analysis. This is discussed further in section 4.2.

Ofcom, the FCC, the IDA and the NZCC have all engaged third party companies to recruit volunteers and conduct the testing.[16] The ACCC would likely also engage an independent third party to conduct the testing and, in the event that the ACCC decided to implement the program, would publish a formal request for tender. In that regard, the ACCC would appreciate views from potential testing companies on a number of the issues discussed in this paper which would affect the technical and cost viability of the program.

Questions on which the ACCC is seeking views:

1. Do you agree that a probe-based testing methodology would be the most reliable and accurate approach for the Australian context?

2. If you consider an alternative approach preferable, what approach do you prefer and why?

4.2 Scope

Should the ACCC secure the financial support required to implement a monitoring program, a key issue to resolve would be the breadth of data which should be collected by the proposed program and the sample configuration which would allow for accurate results while meeting budgetary constraints.

As the primary aim of any broadband performance monitoring and reporting program would be to provide information to industry and consumers on the real-world performance of broadband services in Australia, the ACCC would need to ensure that the sample is representative of the Australian broadband market.

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[16] In the US, volunteers are allowed to keep their testing device after the program has completed as a means of encouraging volunteers to participate. The volunteers are also provided with performance monitoring software for their own connection. Similar schemes are used in the UK and New Zealand to attract participants.

The ACCC is currently seeking views on four parameters which would help determine the scope of any program in Australia:

- the types of services which should be tested

- the cities or regions from which data should be collected

- the number of ISPs whose services should be tested

- the number and type of speed tiers which should be tested.

If the ACCC was to adopt a probe-based approach, the number of probes for each service, ISP, region and speed tier would need to be determined. In this regard, it is important to note that the accuracy and quality of the testing data increases with the number of distributed probes. However, the number of distributed probes (and therefore, the cost of the program) increases rapidly with each additional ISP, region or speed tier. The ACCC would, therefore, need to weigh the benefits of obtaining particular information with the associated costs for obtaining it. Increases in costs which do not proportionately increase the benefits provided by the program would be unlikely to be adopted. The ACCC requests that stakeholders keep this in mind when responding to the questions outlined below.

The ACCC is committed to engaging closely with ISPs to ensure that the results of any testing would accurately represent the current state of the broadband services market, particularly as it changes over time, and any other issues which may affect the reliability of reporting. For example, the ACCC would seek to ensure that ISPs with a particular customer base would not be disadvantaged by decisions made on the appropriate sample set.

4.2.1 Services

Broadband services in Australia may be supplied to premises using ADSL, HFC, optical fibre, fixed wireless or satellite technologies. Alternatively, they may also be supplied over 3G or long term evolution (LTE or 4G) mobile networks.

The majority of broadband services in Australia are currently provided using ADSL, HFC and mobile (3G/4G) technology.[17] However, as the rollout of the NBN progresses, the ACCC expects the number of optical fibre, fixed wireless and satellite services to increase.

ADSL services are provided over Telstra's ubiquitous copper network and constitute the majority of fixed-line broadband services in operation in Australia—approximately 80 per cent in December 2012.[18] There are also two major HFC networks operated by Telstra and Optus. These networks are located in Adelaide, Brisbane, the Gold Coast,

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[17] Approximately 98 per cent in December 2012 (see: Australian Bureau of Statistics, 8153.0 Internet activity, Australia, December 2012).

[18] Australian Bureau of Statistics, 8153.0 Internet activity, Australia, December 2012.

Melbourne, Perth and Sydney. iiNet operates smaller HFC networks in regional Victoria as well as FTTP and FTTN networks in the ACT and Queanbeyan.

Whilst there are a number of additional optical fibre networks operated around Australia, these are mainly in 'greenfield' estates (that is, new housing estates which are being or have recently been developed on vacant land) and do not constitute a large proportion of the Australian fixed-line broadband services market. For example, as at December 2012 HFC services represented around 16 per cent of fixed-line broadband services compared to 2 per cent for optical fibre.[19]

Many consumers will continue to use ADSL and HFC services throughout the rollout of the NBN. Therefore, the ACCC considers that any broadband performance monitoring and reporting program should include ADSL and HFC services as it would provide useful information to consumers in the short to medium term. As the rollout accelerates and consumers migrate to the NBN, these services would become less relevant and the testing of services provided over the NBN would increase. Testing probes could be redeployed to NBN-based services and/or additional volunteers could be sought over time so that a representative sample is maintained.

Below is a table of the largest fixed-line broadband networks in Australia based on the number of services in operation:[20]

Network technology	Major network operators	Coverage	Percentage of total fixed-line broadband services
ADSL	Telstra Optus, TPG, iiNet (via ULLS)	National	~80%
HFC	Telstra, Optus, iiNet	Selected metropolitan cities and regional VIC	~16%
FTTP	iiNet, OptiComm	Selected areas across Australia (incl. ACT and greenfield estates)	~2%
FTTN (VDSL)	iiNet	ACT/Queanbeyan	

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[19] Australian Bureau of Statistics, 8153.0 Internet activity, Australia, December 2012.

[20] Australian Bureau of Statistics, 8153.0 Internet activity, Australia, December 2012.

NBN	NBN Co	*Roll out in progress*	

Until recently, the majority of international regulators have chosen not to include mobile broadband services in their monitoring and reporting programs. The FCC indicated in its July 2012 report that mobile broadband services were not included in the study due to special challenges inherent in measuring the actual performance of mobile networks but that it was working to address those challenges.[21] The FCC has now indicated that it will be releasing a separate report on mobile broadband performance in 2013.[22]

Ofcom undertook a one-off mobile broadband performance study in 2010. Ofcom's study of mobile broadband performance focused on services delivered via dongles and data cards, as opposed to those delivered to smartphones and other mobile devices (which form the majority of mobile broadband services in Australia). This study was not continued. However, Ofcom has indicated that it will be carrying out research around December 2013 to assess the average mobile broadband speeds received by 3G and 4G customers.[23] Ofcom expects to publish the results in spring 2014.

Australia has very high mobile broadband penetration rates, with mobile technology accounting for 49 per cent of all broadband connections.[24] Consumer reliance on mobile broadband continues to increase with the growing popularity of smart phones and tablets. However, the testing methodology outlined in this paper would not be suitable for testing the performance of mobile services and their inclusion would significantly increase the costs of implementing the program. Accordingly, the ACCC is proposing to limit the scope of any program to fixed-line broadband services in the short term, but would consider options for the inclusion of mobile broadband services in the future.

Another issue to consider is whether the ACCC would monitor residential broadband services alone, or whether it would include business-oriented services in the program. Of the international regulators mentioned above, the NZCC is currently the only one which monitors both business and residential services.

Small businesses are increasingly relying on the internet for their day-to-day operations with some being completely internet-based. Similar to residential consumers, small businesses are unlikely to have visibility over the performance characteristics of their broadband services and would benefit from having such information available when

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[21] FCC, 2012 Measuring Broadband America: July Report – A report on consumer wireline broadband performance in the US, July 2012, page 9.

[22] FCC, 2013 Measuring Broadband America: February Report – A report on consumer wireline broadband performance in the US, February 2013, page 33 and http://www.fcc.gov/measuring-broadband-america/2013/February. Consumers who volunteer for this program will download an application onto their smartphones, which will serve the same function as fixed-line HMUs.

[23] http://media.ofcom.org.uk/2013/03/14/average-uk-broadband-speeds-hit-double-figures/

[24] Australian Bureau of Statistics, 8153.0 Internet activity, Australia, December 2012.

assessing whether particular services are suited to their needs. From a technical perspective, small businesses will often obtain the same kinds of services as residential customers even if they are offered faster fault rectification times and/or better support in terms of customer service availability.

On the other hand, larger businesses are likely to be in a better position to ascertain whether a particular service is appropriate for their needs, and in many cases will use 'business-grade' services which have specific performance commitments. For those reasons, and given the additional costs associated with obtaining this data, the ACCC would not currently propose to monitor business-grade services.

In summary, the ACCC considers that an appropriate broadband performance and monitoring program in Australia would monitor residential and small business fixed-line broadband services provided over ADSL and HFC networks as well as the NBN (including optical fibre, fixed wireless and satellite services).

Questions on which the ACCC is seeking views:

3. What services should be included in the ACCC's proposed performance monitoring and reporting program? In particular:

   a) Do you agree that the ACCC should monitor ADSL, HFC and NBN-based broadband services?

   b) Do you agree that the ACCC should monitor small business broadband services?

   c) Are there any other services which you consider should be included in the proposed program? In your response, please outline reasons.

4.2.2 Regions

Another key question is the geographic scope of the proposed program. The ACCC is currently considering whether data should be aggregated at a national level or whether it should involve a representative sample from specific cities or regions to provide more localised analysis.

The FCC has stated in its report that it analyses performance data at the national level as the results are not collected in a way that permits meaningful conclusions at the local level. At this stage, the ACCC has a preference to monitor broadband performance at a more disaggregated level which could assist ISPs and network operators to identify areas where further investment in capacity should be made and to provide consumers with a better idea of the broadband performance likely to be experienced in their area.

One approach may be to monitor major metropolitan areas only—for example, the 10 largest Australian cities by population. Whilst this would be the simplest approach, the results may not reflect the broadband experiences of consumers in rural and regional areas due to the different network characteristics in these areas (for example, longer backhaul routes).

The ACCC could, however, in addition to metropolitan cities, obtain data on a state-by-state basis for rural and regional customers. For example, each State/Territory could be separated to include regions consisting of the largest metropolitan cities (e.g. capital cities and large metropolitan areas such as the Gold Coast and Newcastle) and a single region consisting of all rural and regional areas outside the relevant metropolitan cities.

Ofcom's participants are distributed in three defined geographical markets ranging from the least populated Market 1 (approximately 12% of premises in the UK) to the most populated Market 3 (approximately 78% of premises).[25] Ofcom also separates services into urban (Markets 2/3) and rural (Market 1) markets to compare differences in service quality arising from the different geographical characteristics. Whilst Ofcom does report by region, it has stated that the sample sizes in certain regions of the UK result in a larger error margin for some regions as compared to others. This may be an issue for the ACCC to consider, particularly for rural and regional areas in Australia, where it may be difficult to obtain sufficient sample sizes for each service, ISP and speed tier.

It is important to note that the ACCC's proposed monitoring and reporting program would not provide information on individual consumer broadband performance. However, it would show trends on service performance between different technologies, ISPs and regions. For example, it would likely be able to show if a particular ISP or network operator has not invested in sufficient capacity (such as backhaul transmission) in a particular region.

The ACCC is seeking views from stakeholders on the appropriate geographical regions for the proposed program.

Questions on which the ACCC is seeking views:

4. How should the ACCC determine which regions to monitor as part of any program? In particular:

    a) How many Australian cities do you consider should be monitored as part of the proposed program? How could these be determined by the ACCC?

    b) Would you consider State or Territory regions which encompass rural and regional areas outside of each major city would be sufficient to provide information to consumers living in these areas on the performance of broadband services? For example, a Victorian rural/regional delineation which encompasses services outside of metropolitan Melbourne.

4.2.3 Internet service providers

There are a large number of ISPs supplying ADSL services in Australia. Similarly, there are currently over 40 retail ISPs supplying services over the NBN. This number is

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[25] Ofcom, UK fixed-line broadband performance, November 2012: Research Report, page 54.

likely to increase as the rollout progresses. In regards to HFC, there are only three providers in Australia—Telstra, Optus and iiNet. Telstra and Optus provide the majority of HFC services.

The ACCC does not propose to monitor each ISP providing broadband services in Australia. In addition to the high costs which would be incurred in doing so, it may be difficult to establish a representative sample for smaller ISPs.

Both the FCC and Ofcom currently monitor the largest ISPs by market share. In Ofcom's report from November 2012, it measured eight ISPs accounting for over 60 per cent of the UK residential broadband market. Similarly, the most recent FCC report presents performance results for 14 ISPs (including one satellite provider) which serve over 80 per cent of the US broadband market.

In Australia, the four largest ISPs accounted for around 90 per cent of subscriber share in the provision of fixed-line broadband services as at December 2012.[26] However, the ACCC recognises the benefits to competition, and ultimately to consumers, in testing the services of ISPs beyond the very largest. The ACCC is therefore minded to consider the inclusion of any ISPs for which a sufficient sample of services can be obtained.

One approach could be to monitor ISPs with the largest number of services in operation for each technology; for example, the five largest NBN-based satellite ISPs in Australia. Similarly, ISPs could be chosen by region; for example, the five largest ISPs in rural and regional Victoria.

Having regard to the above, the ACCC is seeking views from stakeholders on the appropriate approach to determine which ISPs should be monitored as part of the proposed program.

Questions on which the ACCC is seeking views:

5. How should the ACCC determine which ISPs to monitor for ADSL and NBN-based services? For example:

   a) Should the ACCC monitor the largest ISPs by total market share in the Australian fixed-line broadband market?

   b) Should the ACCC monitor the largest ISPs by market share for each technology?

   c) Should the ACCC monitor the largest ISPs by market share for each region?

6. If you consider that another approach to determining which ISPs to monitor is preferable, what is it and why do you prefer that approach?

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[26] Source: publicly reported subscriber numbers, data obtained under the ACCC's CAN and Infrastructure Record Keeping Rules. The iiNet Group is considered a single ISP for this purpose.

> 7. Should the ACCC monitor all providers of HFC in Australia, or limit testing to the two major networks operated by Telstra and Optus?

4.2.4 Speed tiers

There are a number of speed tiers for each of the different services provided by ISPs over the NBN. NBN fibre customers currently have access to maximum download and upload speeds ranging between 12/1Mbps and 100/40Mbps.[27] NBN Co is planning to offer two speed tiers for fixed wireless services (12/1Mbps and 25/5Mbps) and while satellite customers on the interim satellite service currently have access to speeds up to 6/1Mbps, this will increase to 12/1Mbps on the long term satellite service.

Both Telstra's and Optus' HFC services are capable of delivering speeds of around 100Mbps. However, the ACCC understands that 30Mbps services may still be available on some plans and in particular areas. On the other hand, iiNet offers four HFC speed tiers ranging between 12/1Mbps and 100/8Mbps.

At this stage, the ACCC is unlikely to monitor every NBN or HFC speed tier. This would increase the overall costs of the project and may not be particularly useful in the early stages of the NBN rollout if there are insufficient customers acquiring a particular service to be able to obtain a representative sample. The ACCC is therefore considering which speed tiers would provide consumers and industry with the most useful guidance on the overall performance of an ISP or particular technology. One option may be to monitor the 'most popular' or entry-level speed tiers with a view to adding more speed tiers as the rollout progresses. However, monitoring the highest available speed tier may give the best indication of the performance of the broader network—as it will be more visible, particularly during peak times, if an ISP's network is congested.

There are two ADSL service offerings in Australia—commonly referred to as ADSL1 and ADSL2+. ADSL1 and ADSL2+ services are capable of delivering broadband services of up to 8Mbps and 24Mbps respectively (depending on factors such as copper length and quality). However, these peak speeds are rarely achieved by end-users in the ordinary day-to-day use of their service. The majority of services provided in metropolitan areas today use ADSL2+ technology. However, monitoring these services alone may fail to capture the experiences of consumers in rural and regional areas where only 64 per cent of exchanges are ADSL2+ enabled (with the remainder of services provided over ADSL1).[28] Accordingly, the ACCC considers the testing program should also monitor ADSL1 services.

The below table summarises the speed tiers currently available over broadband networks in Australia (as outlined above):

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[27] NBN Co, Product and Pricing Overview for Service Providers, December 2011, page 19.

[28] Telstra Wholesale list of internet grade ADSL enabled exchanges (available at
http://telstrawholesale.com.au/products/broadband/adsl/adsl-reports-plans/index.htm)

Network technology	Advertised speed tiers
ADSL	Up to 8Mbps for ADSL1 and up to 24Mbps for ADSL2+
HFC	Between 12/1Mbps and 100/8Mbps
NBN Fibre	Between 12/1Mbps and 100/40Mbps
NBN Fixed wireless	Up to 12/1Mbps and 25/5Mbps
NBN Satellite	Up to 12/1Mbps (6/1Mbps for interim service)

It should be noted that, whilst ADSL services are capable of high access line speeds, the data transfer rates experienced by end-users are significantly affected by distances from the exchange to the end-users' premises. Ofcom normalises data in relation to ADSL customers based on distance from the exchange to ensure that there are no biases between ISPs with different distance profiles.[29] Ofcom has, however, used the raw data to provide information to the public on the variation of speeds depending on the distance from the exchange to the end-users' premises.

Ofcom currently separates services into three speed tiers: services which have a headline speed ranging between 2 and 10Mbps, services which have a headline speed ranging between 10 and 30Mbps and services with headline speeds above 30Mbps. Ofcom includes ADSL2+ services in the 10 to 30Mbps speed range.[30] These groupings are useful in that they allow different service technologies which have similar headline speeds to be compared on the basis of actual performance. The FCC has adopted a similar approach but with lower speed ranges (up to 3Mbps, 3 to 10Mbps, and above 10Mbps). Another benefit of this approach is that it would allow the ACCC to monitor ISPs which have chosen to offer different headline speeds over their network(s) as compared to other providers (for example, in the case of iiNet's HFC network).

The ACCC has not come to a view on which approach would be more appropriate in the Australian context and is seeking views on this issue. Specifically, whether to measure specific speed tiers or to identify several speed ranges (e.g. up to 12Mbps, between 13 and 30Mbps, between 31 and 100Mbps) as has been adopted by the FCC and Ofcom.

Questions on which the ACCC is seeking views:

8. Do you agree the ACCC should test both ADSL 1 and ADSL2+ services?

9. Should the ACCC test specific speed tiers for HFC and NBN-based services or

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[29] Ofcom, UK fixed-line broadband performance, November 2012: Research Report, page 13.

[30] Ofcom, UK fixed-line broadband performance, November 2012: Research Report, Figure 1.1, page 6.

> should it test services falling within particular speed ranges? Please explain if and why you prefer a particular approach.

4.2.5 Sample size

Having regard to the discussion regarding each of the parameters above, and the need to balance the benefits of obtaining particular information with the associated costs for obtaining it, the ACCC is seeking views on the importance of each of the identified parameters when determining the scope of the program. For example, is it more important to include additional regions in the study or to have more probes per region? Is it more important to test a large number of ISPs or to have more probes per ISP?

An example of how each of the different parameters can have an effect on the number of distributed probes and, accordingly, the cost (and viability) of implementing the program is outlined in the table below. For this example, the ACCC has chosen between 10-15 probes per sample set. However, the ACCC is seeking views, particularly from industry, on this issue. For example, how many probes would be required to represent an average consumer's experience when acquiring a specific ISP's NBN-based fibre package with a headline speed of 12/1Mbps in the city of Melbourne?

The total number of probes outlined in the table below represents the minimum number of participants which would be required by the ACCC to acquire the specified sample example. Similarly, the number of services in the table includes both the relevant technology and speed tier (e.g. one 'service' could be a 100Mbps HFC service).

No. of ISPs	No. of cities and/or regions	No. of services	No. of probes per sample set	Total no. of probes
5	10	2	10	1,000 probes
7	15	4	10	4,200 probes
10	20	4	15	12,000 probes

By way of contrast, Ofcom's report from November 2012 provides the results for just over 2,000 participants, which were drawn from a pool of over 40,000 volunteers.[31] The participants were chosen in order to ensure that the results are representative of the UK broadband population. Sample quotas were set by geographic market definition, market shares (by ISP and product), and distance from the exchange.

The FCC recruited approximately 10,000 participants from over 75,000 volunteers in the US with results from around 6,700 participants reported in its February 2013 report.[32] Samples were organised with a goal of covering the major ISPs, each of the

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[31] Ofcom, UK fixed-line broadband performance, November 2012: Research Report, page 53.

[32] FCC, 2013 Measuring Broadband America: February 2013 – Technical Appendix, July 2012, page 5.

relevant broadband technologies, the four Census regions (Northeast, Midwest, South and West) and the three different speed ranges.

The ACCC is also seeking views from potential testing companies on the importance of particular parameters for obtaining a representative sample and for the viability (both technically and financially) of the proposed program.

Questions on which the ACCC is seeking views:

10. What is the minimum number of probes which would be required to provide robust results on the broadband performance likely to be experienced by consumers acquiring a particular ISP package or offering in a particular region (i.e. per sample set)?

11. Which of the variables (ISP, geographic region, speed tier or size of each 'sample set') is most important and why?

4.3 Metrics

4.3.1 Data transfer rates or throughput speeds

The key metric for any broadband performance monitoring and reporting program in Australia would be downstream and upstream data transfer rates or 'speeds'. That is, the rate at which data is transferred (i.e. downloaded or uploaded) over a particular connection.

When testing throughput, the FCC considers both 'sustained' and 'burst' speeds. Sustained speeds refer to the data transfer rates averaged over a period of several seconds and burst speeds refer to the effect of techniques used by cable-based ISPs to temporarily increase data transfer rates. The FCC monitors and reports on average 'sustained' peak throughput between 7pm and 11pm on weeknights. Ofcom reports on average speeds over a 24 hour period, maximum or off-peak speeds (which are measured between the hours of 12am and 6am) and peak speeds (measured between 8pm and 10pm). Both the FCC and Ofcom compare ISP performance for each of the above against the relevant ISP's advertised headline speed (usually as a percentage).

The ACCC would likely seek information on performance of services during peak periods as this is when most consumers use their services. However, it may also seek information on off-peak performance to ascertain the level of service degradation during peak periods.

Questions on which the ACCC is seeking views:

12. What information regarding download and upload data transfer rates (or 'speeds') would be most useful for ISPs and for consumers? In particular:

   a) Do you agree that the ACCC should monitor both peak and off-peak data

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transfer rates?

b) What is the daily peak or 'busy' period for demand on broadband bandwidth in Australia?

c) To what extent are 'burst' speeds available for consumers in Australia and should they be accounted for in the ACCC's proposed testing program?

4.3.2 Additional quality of service metrics

While data transfer rates are an important factor, there are additional factors which affect the overall performance of broadband services and the end-user's overall broadband experience. The ACCC considers that a robust monitoring program could include testing of (but need not be limited to) the following additional metrics:

- *Packet loss:* The proportion of data packets lost during the transmission of data across a network.

- *Latency:* The time it takes for a packet of data to travel to a designated point in the network and back (often referred to as 'round-trip' latency).

- *Jitter:* The rate of change in latency. This metric relates to the stability of a connection.

- Factors which affect end-user web browsing experiences:

  o *Webpage browsing speed:* The time taken to load a webpage (i.e. to fetch the main HTML and assets such as text, basic code and content).

  o *Domain name service (DNS) resolution:* The time taken for an ISP to translate website names (such as website.com) into IP addresses (e.g. 123.255.255.00).

  o *DNS failure:* The proportion of requests for which the DNS service cannot translate a domain name to an IP address.

Ofcom monitors each of the above metrics and compares the results on an average and on-peak basis. In addition to data transfer rates, the NZCC monitors latency and webpage browsing speed. The FCC also monitors latency. The IDA obtains information relating to on-net peak throughput speeds, webpage download speeds for local and international (US) websites, latency and packet loss.

The ACCC notes that some over-the-top content service providers (such as internet protocol television providers) may be affected by additional factors relating to service quality which have not been listed above. In this regard, the ACCC is interested in what these factors are and whether they can and should be tested by any program implemented by the ACCC.

The ACCC is seeking views from all relevant stakeholders on the quality of service parameters which should be monitored by any testing of broadband performance in addition to data transfer rates.

Questions on which the ACCC is seeking views:

13. What additional quality of service parameters should the ACCC monitor so as to obtain rich and meaningful information regarding the performance of broadband services in Australia? In your response, please state each factor which you consider should be tested and why.

4.4 Reporting

The ACCC considers that any reporting on broadband performance should focus on empowering consumers to make informed decisions. It should also provide ISPs with transparency over competitor offerings to be able to compete on quality and make decisions on investment in capacity.

As previously stated, the ACCC is committed to engaging closely with industry on any issues which may affect the reliability of reporting. For example, the ACCC recognises the need to ensure that there are procedures in place to take into account any non-ongoing network issues (such as natural disasters) which may affect performance of services at a particular time and/or place. In addition, the ACCC may request additional information from providers on a confidential basis to clarify certain performance aspects and would likely provide a copy of the report to relevant ISPs prior to its release.

Ofcom and the FCC publish the results of their testing on a six monthly and yearly basis respectively. The reports are in narrative form, containing observations and commentary regarding trends in the performance of ISPs and across the industry. They are also accompanied by illustrative charts. For example, the following graph was provided in Ofcom's recent report from November 2012 to demonstrate the differences in performance between particular ADSL ISP packages during peak, off-peak (maximum) and as an average over a 24 hour period.[33]

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[33] Ofcom, UK fixed-line broadband performance, November 2012: Research Report, page 13.

Figure 2.1   Maximum, average and peak-time download speeds for ADSL2+ ISP packages: November 2012
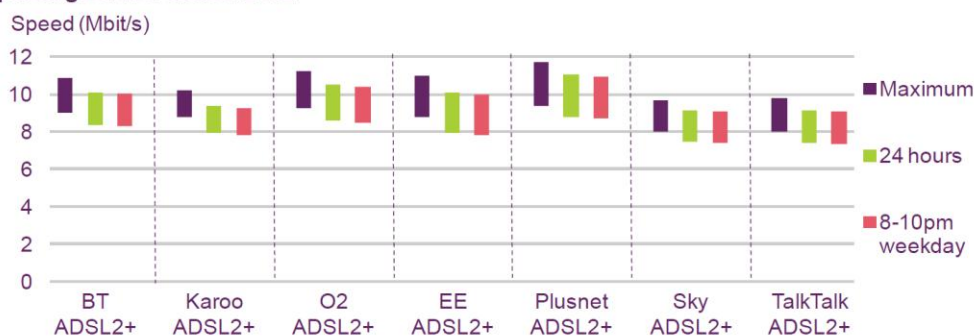
Both the FCC and Ofcom choose a particular month in the period and report extensively on those results, rather than averaging across the entire year. However, these results are often compared to results from previous testing periods. On the other hand, the IDA publishes data on a monthly basis through interactive graphs on its website.[34] The IDA does not appear to provide any analysis or observations on the results, though it may choose to do so in the future.

The NZCC has not published any reports to date. However, its contractor TrueNet releases a report each month on broadband performance using graphs and providing high-level commentary (including any noteworthy improvements or declines in performance of particular ISPs).[35]

There is necessarily a trade-off between the level of detail reported and the frequency with which data can be made public. The ACCC could, for example, report monthly, quarterly, bi-annually or annually. The level of detail in the reports would, however, decrease the more regularly that the results were released.

The ACCC has preference for a reporting framework which allows it to provide a medium to high level of detailed commentary such as those provided in the bi-annual Ofcom and annual FCC reports. However, a summary of certain performance results could also be released more often (e.g. monthly or quarterly). The ACCC is seeking views on what would be the best approach in the Australian context.

The ACCC also recognises that there is a trade-off between the currency of the data that can be reported on and the level of detail that can go into any reported analysis. Consequently, consumers may be accessing out-of-date information when performance results are not reported in real time. Furthermore, reporting on the metrics discussed in this consultation paper will not capture every aspect of the end-user broadband experience. However, the information provided by the proposed program would substantially improve the current position of consumers and industry who currently have little visibility over the real-world performance of broadband services.

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[34] http://www.ida.gov.sg/applications/rbs/chart.html.

[35] https://www.truenet.co.nz/news/Performance

The ACCC is also considering how it will treat the raw data collected by the program. For example, in addition to releasing the public reports, the FCC provides raw data from testing directly to the public for analysis. Another option would be to make the raw data available solely to participating ISPs. The ACCC is therefore seeking views from industry, as well as any other interested stakeholders, on whether the ACCC should make the raw data publicly available and to whom.

Any third party testing company which is ultimately contracted to conduct the testing may also have an interest in retaining access and control over the raw data, and may therefore wish to submit views on how the ACCC's treatment of this data could affect the viability of the program.

Questions on which the ACCC is seeking views:

14. What do you consider is the best approach to reporting on broadband performance in Australia? In particular:

   a) How often should the ACCC report on the results of its broadband performance testing?

   b) Do you agree that the ACCC should provide detailed observations, commentary or analysis on the results of testing?

15. To what extent would industry (e.g. ISPs) value access to the raw data collected by any testing program and want to have access to it?

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5 Summary of questions

technology?

    c) Should the ACCC monitor the largest ISPs by market share for each region?

6. If you consider that another approach to determining which ISPs to monitor is preferable, what is it and why do you prefer that approach?

7. Should the ACCC monitor all providers of HFC in Australia, or limit testing to the two major networks operated by Telstra and Optus?

Speed tiers

8. Do you agree the ACCC should test both ADSL 1 and ADSL2+ services?

9. Should the ACCC test specific speed tiers for HFC and NBN-based services or should it test services falling within particular speed ranges? Please explain if and why you prefer a particular approach.

Sample size

10. What is the minimum number of probes which would be required to provide robust results on the broadband performance likely to be experienced by consumers acquiring a particular ISP package or offering in a particular region (i.e. per sample set)?

11. Which of the variables (ISP, geographic region, speed tier or size of each 'sample set') is most important and why?

Metrics

12. What information regarding download and upload data transfer rates (or 'speeds') would be most useful for ISPs and for consumers? In particular:

    a) Do you agree that the ACCC should monitor both peak and off-peak data transfer rates?

    b) What is the daily peak or 'busy' period for demand on broadband bandwidth in Australia?

    c) To what extent are 'burst' speeds available for consumers in Australia and should they be accounted for in the ACCC's proposed testing program?

13. What additional quality of service parameters should the ACCC monitor so as to obtain rich and meaningful information regarding the performance of broadband services in Australia? In your response, please state each factor which you consider should be tested and why.

Reporting

14. What do you consider is the best approach to reporting on broadband performance in Australia? In particular:

a) How often should the ACCC report on the results of its broadband performance testing?

b) Do you agree that the ACCC should provide detailed observations, commentary or analysis on the results of testing?

15. To what extent would industry (e.g. ISPs) value access to the raw data collected by any testing program and want to have access to it?

Attachment A

	United States	**United Kingdom**	**Singapore**	**New Zealand**
Services tested	ADSL, HFC, fibre (FTTH) and satellite	ADSL, HFC and fibre (FTTC)	ADSL, HFC and fibre (FTTH)	ADSL, VDSL, cable and fibre (FTTH)
Regions tested	National level (the four Census Regions - all states across the US)	Region level (three geographic markets across the UK)	National level	National level
Number of ISPs tested	14 largest ISPs in the market, representing over 80% of the US residential broadband market	8 largest ISPs in the market, representing over 60% of the UK residential broadband market	3 ISPs	20 ISPs[36]
Speed tiers tested	- Up to 3Mbps - Between 3 and 10Mbps - Above 10Mbps	- Between 2 and 10Mbps - Between 10 and 30Mbps - Above 30Mbps	All of the published plans for each of the 3 ISPs	Information not available
Sample size	~6,700 probes	~2,000 probes	~900 probes	~400 probes

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[36] The NZCC only reports on ISPs where there are 5 or more probes working during any particular month (this amounts to approximately 7-8 ISPs according to the monthly TrueNet reports – available at https://www.truenet.co.nz/news/Performance)