CONSUMER PROTECTION ASSOCIATION
HIMMATNAGAR
DIST. : SABARKANTHA
GUJARAT

CONSULTATION PAPER ON AMMENDMENT TO THE STANDARDS OF QUALITY OF SERVICE FOR WIRELESS DATA SERVICES REGULATION 2012

COUNTER COMMENTS

Introduction :

Mobile connectivity and smart - phone penetration, concentrated mainly in urban and metro areas today, are widely accepted to grow across the country and provide significant impetus to GDP growth and quality of life to residents in rural

areas.

Ericsson estimates India’s Mobile subscriber base and adoption of smart - phones in India are expected to grow significantly in the remainder of the present decade. Indeed, by one estimate India's mobile subscriber base will grow from 795 million in 2013 to 1145 million subscribers by 2020. Simultaneously, smart - phone penetration will grow from 10 per cent or 90 million devices in 2013 to 45 per cent or 520 million devices.

We have seen that service providers are advertising consistent high speed wireless data service but, actual speed is not even 10% of them. To restrict such bogus speed claim, it is better to prescribe the benchmark. This will allow users to have clarity and assurance on the minimum down load speed they would get from their service provider.

TRAI should promote the applications used by consumer enabling them to test their own QoS. QoS testing initiated by end-users has the advantage of offering a large number of test

samples with little effort on the side of operators and regulatory authorities, in comparison to traditional measurement methodologies (Lab testing etc.).

Various surveys in Singapore have shown that, Internet users rank reliability, access speed, access charges and customer service in order of importance. This suggests that there is a role for the QoS regulator.

Counter comments :

Spectrum management:

Some ISPs stated regarding Spectrum. Actually Spectrum policy is guided by the principle of Maximum usage of spectrum. In emerging economies spectrum management must achieve the development goals of universal telecom access at low price. It is technically inefficiency on the part of ISPs.

Now a days the focal point of regulation of scarce resources, namely spectrum, has changed from pure coordination and planning to the creation of a competitive and sustainable

environment for various telecom services. While the technical approach to frequency management mainly focuses on maximizing the supply of radio frequencies by making the utilization more efficient, economic approaches deal with the demand side as well.

The spectrum allocation criterion laid down by TRAI (2007), should take in to account, methodologies such as synthesized frequency hopping, frequency reuse, discontinuous transmission, antenna hopping, and use of AMR codec for efficiently utilizing allotted spectrum. The service providers should strictly follow the criteria to make more spectrum available free.

Efficient use of BTSs

To improve that productivity of BTSs, the operators should be encouraged to use the different steps to improve the traffic supported at each cell sites.

Technical aspects, Network related, Users related etc. :

We are not agree with comments presented by the ISPs and their organizations because the same problems are facing the service providers of other countries, even though, they are maintaind high quality of QoS since long.

As data extracted from Net Index, India is ranked 93rd in a group of 110 countries. The QoS can be made possible only via strong policy guidance.

Several solutions are available or in development for mobile networks and for fixed broadband networks. TRAI should intend therefore to promote such solutions.

The Telecommunication Authority of Singapore (TAS), attempts to regulate quality of service in Singapore. TAS requires Internet access providers to report quarterly on three key indicators--currently defined as network availability, service accessibility and service activation time.

Global :

We would like to draw your kind attention that in Singapore even in tunnels they have prescribed benchmarks.

The Infocomm Development Authority of Singapore (IDA) has raised the minimum quality of service (QoS) standards for 3G mobile services in phases with effect from 1 April 2012 so that, consumers can benefit from better quality of 3G mobile services. This is the latest measure that IDA has put in place to ensure a better mobile and broadband experience for consumers. Other consumer protection measures has come into effect from 2012 include the barring of Premium Rate Services (PRS), limiting of data roaming charges and publication of typical broadband speeds.

In reviewing the 3G mobile QoS standards, IDA took into consideration the nature of mobile/wireless technology where there could still be areas where it will be technically difficult for mobile signals to penetrate, e.g., due to location of users or surrounding building structures. For buildings or homes with poor coverage, the operators are required to take reasonable efforts to

address these issues. In some cases, operators may need to install dedicated equipment within units and/or building premises.

The enhanced 3G mobile QoS framework includes more stringent standards for 3G mobile service coverage in the following areas:

- Nationwide outdoor areas (to more than 99 per cent from more than 95 per cent previously)
- road and Mass Rapid Transit (MRT) tunnels (to more than 99 per cent from more than 95 per cent for new tunnels) and
- within buildings (more than 85 per cent coverage within each building).

Indicators (For Compliance)	Current QoS Standard	Revised QoS Standard	Revised QoS standards will be effective starting from:
Service coverage			
Nation-wide Outdoor Coverage	>95% across all roads	>99% of nationwide outdoor space	1 April 2012
In-building	>85% at public access areas	>85% coverage in each building	1 April 2013
Tunnels Coverage (Road	>95% (average across all road and MRT tunnels tested)	>99% (in each new road and MRT tunnel)	All road & MRT tunnels: 1 April 2012

Indicators (For Compliance)	Current QoS Standard	Revised QoS Standard	Revised QoS standards will be effective starting from:
and MRT tunnels)			CTE: 1 January 2015
		>95% (in each existing road and MRT tunnel) [1]	
Success rate for PSTN / mobile originated calls during busy hour	For monitoring	Average monthly success rate across all cell location: >99% Average monthly success rate in the busiest cell location: >95% Average monthly success rate for each cell locality: >70%	1 April 2012
Drop call rate of PSTN and mobile originated calls	For monitoring	Average monthly drop call rate across the entire month: <> Average monthly drop call during busy hour: <> Average monthly drop call during hour with worst performance: <2%>	1 April 2012

Note: The financial penalties will be "up to $50,000" per indicator for every instance of non-compliance. This is up from the earlier financial penalty of $5,000 per indicator, per month.

[1] For existing tunnels, the revised QoS standard of >99% will be used as a monitoring standard. If the service coverage falls below 99% for any existing tunnel after 1 April 2012, IDA will not impose financial penalties but reserves the right to require the FBOs to initiate a review of their tunnel infrastructure and assess the need to fine-tune the networks, or begin to plan for upgrading works to move towards a revised standard of >99% within a reasonable timeframe.

Such solutions are more and more used by other regulatory authorities. The following examples can be cited:

- The German regulatory authority (BNA) describes in the report “The Quality of Service of Broadband Accesses” (April 2013) how it conducted end - user measurements.

- The European Commission has launched a project to provide modems to 10,000 customers across 30 countries to measure Quality of Broadband Services in the EU (March 2012).

- Such an initiative is continuously conducted by the FCC in the USA in the project “USA Measuring Broadband America Project”.

- The French regulatory authority ARCEP explains in its 2013 - 004 decision how it intends to conduct QoS tests initiated by end - users to complement and verify results of measures conducted by operators.

- In Columbia the regulatory authority has established a system where an application on the mobile phone rates radio QoS parameters and these data are automatically accumulated to calculate fines to operators.

* Country such as Thailand have already brought about regulations mandating a minimum download speed.

Cost effective :

Some ISPs stated that Regulating QoS increases cost for all operators at the expense of increasing coverage, capacity etc. but we would like draw your kind attention that :

1. Per subscriber investment falls with increasing availability of spectrum. And

2. Efforts should be made to promote infrastructure sharing.

3. Mobile access speeds available in the market should grow to keep pace with the technology capabilities of both infrastructure providers and equipment manufactures.

Publication of Typical Broadband Speeds

- This requirement is intended to provide more transparency on the broadband speeds so that consumers can make better decisions when choosing a broadband plan which best meets their needs.

It is not true that minimum download speed will create confusion in the customer's mind and hence lead to more consumer complaint, contrarily it will improve information

transparency for consumer mobile broadband plans marketed and advertised by ISPs today.

The typical speeds must be prominently published on the ISPs' websites, brochures, digital and press advertisements, and any other publicity or marketing materials in a clear, easily accessible and easily understood manner, preferably alongside the theoretical speeds. All publicity or marketing materials containing figures on typical speeds must include a prominent footnote or web link directing end users to the ISPs' website or publications where details on the methodology can be found.

We should also specify minimum upload speed. Because Skype call voice etc. requires at least 128 kbps for a very low quality video calls.

The enhanced mobile services QoS framework can take effect in two phases to allow time for the operators to step up their resources, measure their performance under the new framework, and upgrade their networks.

Therefore, You are requested that it should be mandated for service providers to inform the minimum download speed to consumers along with each tariff plan and consumer should be made aware of the various factors responsible for the down load speed for wireless data service through websites and other means of consumer communication.

We are enclosing the " Publication required for all Internet Service Providers " by IDA Singapore for your ready reference.

(Dr. Kashyapnath)
President

Cpa/22-5/14 25.05.2014

To,

Hon. Shri A. Robert J. Ravi,
Advisor (QoS),
Telecom Regulatory Authority of India,
Mahanagar Door Sanchar Bhavan,
Jawaharlal Nehru Marg,
New Delhi : 110002.

Sub. : Consultation paper on " Amendment to the standards of Quality of service for wireless data services Regulation, 2012 - Counter Comments.

Hon. Sir,

Namaskar !

Please find herewith our counter comments for the above said consultation paper on behalf of our organization for your kind perusal.

You are requested to favorably consider our submission.

Thanks.

Yours faithfully,

(Dr. Kashyapnath)
President

INFORMATION PAPER ISSUED BY THE INFO-COMMUNICATIONS DEVELOPMENT AUTHORITY OF SINGAPORE

PUBLICATION REQUIREMENT FOR ALL INTERNET SERVICE PROVIDERS

30 January 2012[1]

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[1] Updated on 12 December 2013.
The industry has sought IDA's clarification with regard to the need for some flexibility on the publication of typical speeds on marketing media such as websites, in-app advertising and TV broadcasts. IDA has provided its clarification to the industry, and has also updated the information paper on the "Publication Requirement for All Internet Service Providers" accordingly; key changes to the Publication Requirement can be found in paragraphs 18 to 19.

PART I: INTRODUCTION

Objective of the Publication Requirement

1. Internet Service Providers ("ISPs") have traditionally advertised their fixed and mobile broadband Internet access plans (hereinafter referred to as "broadband plans") by emphasising the theoretical maximum download speeds. These download speeds are usually qualified using the term 'up to' e.g., *up to* 10 Mbps. This has often created disputes between end users and ISPs over the download speeds that ISPs have advertised, and whether the end users have been misled or short changed. Without sufficiently clear information on the broadband Internet access speeds that end users can expect to experience typically, it can also be difficult for new end users to make informed choices on which broadband plans to subscribe to, even in a competitive market. IDA has received feedback from broadband end users who are dissatisfied that they do not experience the access speeds which are close to the advertised theoretical maximum download speeds, and that the advertisements of these broadband plans do not clearly state the access speeds that end users can typically expect.

2. Internationally, regulators such as those in the United Kingdom ("UK") and Hong Kong have introduced some measures to enhance information transparency on typical broadband Internet access speeds. The UK's Office of Communications ("OFCOM") and Hong Kong's Office of the Telecommunications Authority ("OFTA") have introduced voluntary codes of practice for their ISPs to disclose the typical broadband Internet access speeds that they provide and the surfing conditions under which such speeds are likely to be achieved. Some ISPs there have started to voluntarily disclose the typical broadband Internet access speeds that they provide.

3. Given that the maximum theoretical broadband Internet access speeds advertised by the ISPs are often not achievable, it is reasonable for ISPs to provide end users with information on the typical speeds achievable, prior to end users subscribing to these broadband plans. IDA believes that the ISPs should provide more accurate and complete information about their own services to end users, in order to empower end users to use this information to select a broadband plan that

best meets their needs. It would also help to manage end users' expectations and minimise disputes.

4. In March 2011, IDA announced its requirement for all ISPs to measure and publish the typical broadband Internet download speeds[2] for broadband plans offered to end users (the "Publication Requirement").

Key Aspects of the Publication Requirement

5. IDA has imposed the Publication Requirement on residential fixed broadband plans, including digital subscriber line ("DSL"), cable and fibre broadband services (regardless of whether the ISPs own or lease the underlying platform), and consumer[3] mobile broadband plans that include 3G or 4G mobile data services accessed via mobile handsets or via dongles. Certain categories of broadband plans will be excluded from the Publication Requirement, such as broadband plans with advertised theoretical speeds below 2Mbps, broadband plans that are explicitly offered free of charge to end users, pay-per-use/pre-paid broadband plans and legacy broadband plans that are no longer promoted or offered.

6. At present, business broadband plans are not included under this Publication Requirement as business users often access Internet using different technology platforms (e.g., via leased line or managed data/network service such as IP-VPN), require customised solutions, and are likely to require Service Level Agreements ("SLAs") with ISPs. IDA will continue to monitor the developments in the business broadband service market and assess if there is a need to extend the Publication Requirement to business broadband plans in the future.

7. The details of the Publication Requirement that all ISPs shall comply with are elaborated in Part II.

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[2] While upload speeds may also be important to some end users, IDA believes that for the majority of end users, download speeds play a more crucial role in determining their choice of broadband plan than upload speeds at present.

[3] Consumer mobile Internet broadband access service plans include individual end user plans that are offered to the general public and corporate discount plans that are offered to and subscribed by individual end users who are employees of the qualifying companies.

8. IDA will not prescribe the methodology that ISPs should use to measure and compute the typical download speeds for publication, so long as the measurement and computation methodologies used by the ISPs are clearly explained and published for end users' information. This will allow some flexibility for ISPs to adopt a measurement methodology that best reflect their operating environment and conditions.

9. However, IDA has imposed some minimum parameters that the larger ISPs or Specified ISPs (those with more than 10% of the subscriber base in the relevant market) must adopt in their measurement methodologies to facilitate a broad common baseline across these Specified ISPs. IDA has also specified additional publication requirements for these Specified ISPs, so that more complete information could be provided to end users. The details of the minimum parameters for the measurement methodology and the additional publication requirements for Specified ISPs are elaborated in Part III.

Effective Date of the Publication Requirement

10. The Publication Requirement will take effect from 1 April 2012.

Factors That Affect Broadband Internet Access Speeds

11. Notwithstanding IDA's Publication Requirement, IDA acknowledges that various factors can affect the broadband Internet access speed experienced by an end user and some of these factors may be beyond the ISPs' control. For example, the location of the web content and the capacity provided by the content owner may negatively affect one's surfing experience if the content owner has not provided adequate capacity to meet the demand. Other factors like the device being used to surf the Internet (e.g., PC, mobile handset), the number of concurrent end users accessing the same content at that time and the types and number of concurrent applications running on one's device can also slow down one's Internet access speeds. For mobile broadband plans, access speeds may be further constrained by the inherent nature of wireless technologies. One's mobile broadband Internet surfing experience may be affected by the strength of radio signals at different locations.

Different building structures may also weaken radio signals thus affecting users' surfing experience. End users should bear these factors in mind when accessing broadband Internet services.

PART II: MINIMUM MEASUREMENT AND PUBLICATION REQUIREMENTS FOR ALL INTERNET SERVICE PROVIDERS

Broadband Plans for which All ISPs Must Measure and Publish Typical Speeds

12. At the minimum, IDA requires all ISPs offering residential fixed or consumer mobile broadband plans to publish the typical speeds[4] of each of the applicable residential fixed and consumer mobile broadband plan[5], alongside the theoretical maximum speeds.

13. As a start, the following categories of plans for both residential fixed and consumer mobile broadband services will be excluded from the requirement to measure and publish typical speeds:

a) Broadband plans with advertised theoretical broadband Internet speeds of below 2Mbps, recognising that most plans advertised and offered by ISPs have theoretical speeds of 2Mbps or above;

b) Broadband plans that are explicitly offered free of charge to end users, recognising that since these plans are offered for free, IDA will allow ISPs greater flexibility to provide these services on reasonable effort basis. Broadband plans that are bundled with other services and that are not explicitly offered free of charge, must comply with IDA's requirement and ISPs must publish the typical speeds for such plans;

c) Pay-per-use and pre-paid broadband plans with no monthly recurring broadband service subscription charges and no minimum contractual period, recognising that unlike monthly subscription plans, end users have the ability to stop usage at any time if they are not satisfied with the service quality provided under pay-per-use/pre-paid plans; and

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4 For the purpose of this requirement, typical speeds will refer to the typical broadband Internet access download speeds likely to be experienced by end users. IDA reserves the right to include upload speeds when the theoretical upload speeds are also promoted and advertised, or when such typical upload speed information becomes important to end users.

5 See footnote 2

d) Legacy plans that ISPs no longer advertise, actively promote or offer to new subscribers (i.e., these plans are either slowly being phased out, or only available to existing users who wish to continue with the same service plan).

14. IDA believes that the above scope forms a reasonable starting base-line to improve information transparency for most of the residential fixed and consumer mobile broadband plans marketed and advertised by ISPs today. ISPs may include the above categories of broadband plans on their own volition to enhance information transparency of their services to their end users. IDA reserves the right to include these categories of broadband plans under the measurement and publication requirement, if the need arises in the future.

15. For consumer mobile broadband plans that are advertised based on the same theoretical maximum download speeds (e.g., 7.2 Mbps) but are differentiated by the amount of bundled data usage only, ISPs need only measure and publish the typical speeds of one such broadband plan. However, ISPs must publish this typical speed alongside the theoretical maximum download speed for all the relevant consumer mobile broadband plans, wherever the theoretical maximum download speeds are published in the advertisements, websites, or other publicity materials.

Publication of Typical Speeds by All ISPs in Advertising and Publicity Materials

16. ISPs will have the flexibility to determine how they wish to compute the figures for publication, and whether they wish to publish a single figure or a range, for each applicable residential fixed or consumer mobile broadband plan, so long as the figures that they publish are representative of their end users' experience.

17. The typical speeds must be prominently published on the ISPs' websites, brochures, digital and press advertisements, and any other publicity or marketing materials in a clear, easily accessible and easily understood manner, preferably alongside the theoretical speeds. All publicity or marketing materials containing figures on typical speeds must include a prominent footnote or weblink directing end

users to the ISPs' website or publications where details on the methodology can be found.

18. Notwithstanding the above, IDA will accord flexibility to ISPs for in-app advertisements and website banners, as ISPs may face space constraints publishing the typical speeds near to, or alongside theoretical speeds. This flexibility is accorded on the conditions that these publications are made/ advertised on third-party websites and applications which are not owned and/or operated by the ISPs, and that the ISPs face space constraints for such advertisements. In addition, customers must be able to find more information on the typical speeds when they "click" on the in-app advertisements or website banners.

19. Similar flexibility will also be extended to ISPs for radio broadcasts, which are purely auditory and are bound by time constraints. ISPs should refer listeners to, for example, their websites, or to their hotlines, for more information about the typical broadband speeds.

20. The publication of the typical speeds must also be updated regularly and must reflect the typical speeds from the latest measurement period. ISPs must measure and update typical speeds on a quarterly basis at the minimum. IDA will allow the published typical speeds in print materials such as brochures, billboards or other marketing collaterals to be from an earlier measurement period, as these materials may not be reprinted or updated frequently. However, the measurement period must be clearly stated, and the print materials must include a prominent footnote or weblink directing end users to the ISPs' website or publications where the details on the methodology and the most updated test results can be found.

Publication of Measurement and Computation Methodologies by All ISPs at Websites

21. The following detailed information must be made publicly available at the ISPs' websites:

a) the types of end user device(s)[6] and the network configuration or set-up used for measurement;

b) the number of test clients used and the sample size of measurements per residential fixed or consumer mobile broadband plan;

c) the list of local/international websites used or location of server(s), and the size of the file transfer tested to local/international servers, depending on the measurement methodology adopted;

d) computation of the typical speeds for each residential fixed or consumer mobile broadband plan;

e) explanation of "typical" in non-technical language; and

f) qualifications or explanations of other factors that may affect the broadband Internet access speeds experienced by end users (if any).

22. When disclosing their computation methodology, ISPs should explain what they mean by "typical" speeds and how this is likely to be representative of their end users' experience, either by specifying the extent to which their end users can expect to achieve the published typical speeds, e.g., by stating that end users should be able to achieve the typical speeds X% of the time, or by any other qualifications.

Explanation at All Points-of-Sale to be Provided by All ISPs

23. All ISPs must at least disclose the typical speeds for the relevant broadband plans to all end users before entering into contracts with end users based on their preferred subscription plans. ISPs should also disclose where end users can obtain details on the computation and measurement methodologies for the published typical speeds, and the most updated test results.

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[6] ISPs should use devices that are representative of end user experience. For example, ISPs may use PCs, laptops, mobile handsets, dongles, integrated hardware/software probes, robots and any other devices which can simulate end users' experience.

Summary of Minimum Requirements for All ISPs

24. The table below summarises the minimum requirements applicable to all ISPs:

	IDA's Minimum Requirements for All ISPs
Parameters that ISPs Must Measure and Publish	Typical broadband Internet access download speeds likely to be experienced by end users (ISPs are encouraged to include upload speeds as well)
Broadband Plans for which All ISPs Must Measure and Publish Typical Speeds	All residential fixed and consumer mobile broadband plans with advertised theoretical maximum download speeds of 2Mbps & above (excluding broadband plans explicitly declared to be free, pay-per-use plans, pre-paid plans and legacy plans which ISPs are no longer promoting/offering to new users)
Channels where Typical Speeds must be Published	Prominently on ISPs' websites, digital & press advertising materials, and any other publicity or marketing materials (refer to paragraph 17 - 19) (with weblinks or footnotes that refer end users to the ISPs' website or publications where the details on the methodology and the most updated test results can be found)
Frequency of Measurement and Refreshing the Published Typical Speeds	Quarterly, with the latest measurement results & methodologies
Publication of Measurement and Computation Methodologies at Websites	• The type of end user device(s) and the network configuration or set-up used for measurement • The number of test clients used and the sample size of measurements per residential fixed or consumer mobile broadband plan • The list of local/international websites used or location of server(s), and the size of the file transfer tested to local/international servers, depending on the measurement methodology adopted • Computation of the typical speeds for each residential fixed or consumer mobile broadband plan • Explanation of "typical" in non-technical language (e.g., by stating that users

	should be able to achieve the typical speeds X% of the time, or any other qualifications) • Qualifications or explanations of other factors that may affect the speeds experienced by end users (if any)
Explanation at All Points-of-Sale	• The typical speeds for the relevant broadband plan, in addition to the advertised theoretical maximum download speeds • Where the end user can obtain more details on the measurement of typical speeds

PART III: MINIMUM PARAMETERS FOR THE MEASUREMENT METHODOLOGY AND ADDITIONAL PUBLICATION REQUIREMENTS FOR SPECIFIED INTERNET SERVICE PROVIDERS

Minimum Parameters for the Measurement Methodology

25. Specified ISPs (i.e., ISPs with a subscriber base of more than 10% in the respective retail residential fixed or consumer mobile broadband markets) are required to use a methodology that incorporates the following broad parameters to measure the typical speeds[7].

26. When designing and implementing their measurement methodologies, Specified ISPs should ensure that the methodology adequately represents their end users' usage profiles and experiences. To ensure a minimum standardisation of the measurement methodologies amongst Specified ISPs, IDA has set out the broad parameters of the measurement methodology below. These are the minimum parameters required by IDA and they apply to both residential fixed and consumer mobile broadband plans unless stated otherwise. The parameters are as follows:

a) Measurement during peak and off-peak periods: At the minimum, Specified ISPs are required to take measurements during both peak and off-peak periods for the relevant fixed residential broadband plans. Specified ISPs may identify the peak and off-peak periods on a per plan basis to be more reflective of their users' traffic profile, or to adopt a common peak and off-peak period for all fixed residential broadband plans based on the peak and off-peak periods of the entire network for the measurements, if Specified ISPs assess that the results would still be representative of their end users' experience. For consumer mobile broadband plans, Specified ISPs are not required to differentiate between peak and off-peak periods in their measurements.

[7] See footnote 3

b) Measuring local and international typical speeds: In the event that Specified ISPs advertise their broadband plans with separate local and international theoretical maximum download speeds, or highlight only the theoretical local *or* international maximum download speed, Specified ISPs must measure both the local and international typical speeds separately. This applies to both residential fixed and consumer mobile broadband plans.

c) Measuring typical speeds for mobile broadband plans: For consumer mobile broadband plans, to take into account the mobile nature of mobile broadband services, Specified ISPs are required to measure the typical speeds for both "stationary" and "mobile" conditions, where stationary tests will measure the typical speeds at fixed locations, and mobility tests will measure the typical speeds when on the move at a reasonable vehicular speed, i.e., at least 50km/h.

d) Sample size: For residential fixed broadband plans, Specified ISPs are required to collect at least 200 unique data points[8] per plan. These 200 data points can be taken from both peak and off-peak periods and this sample size will apply for every measurement period (i.e., every quarter). Specified ISPs are encouraged to collect more data points to ensure a more robust test. For consumer mobile broadband plans, Specified ISPs are required to collect at least 200 unique data points for stationary testing and mobility testing combined, per consumer mobile broadband plan, for every measurement period.

e) Frequency of measurement period: At the minimum, Specified ISPs are required to conduct one set of measurements every quarter.

f) Computation methodology: Specified ISPs have the flexibility to adopt a statistically representative figure (e.g., mean or median) to reflect the typical speeds, so long as the figures that they publish are

[8] A data point could refer to the speed measurement from a single data session or each file transferred to a server. ISPs are allowed to define what constitutes a data point under their own measurement methodology.

representative of their end users' experience and disclose their computation methodology upfront.

g) Test equipment: To adequately reflect end users' experience, Specified ISPs should use devices representative of end users' experience to take the measurements. For example, Specified ISPs may use PCs, laptops, mobile handsets, dongles, integrated hardware/software probes, robots and any other devices which can simulate end users' experience.

h) Location of test equipment: Specified ISPs should ensure that the test clients are geographically spread out.

i) For residential fixed broadband plans, Specified ISPs should ensure that the tests are evenly distributed geographically for each measurement period; however, the locations of the tests can remain the same for subsequent measurement periods.

ii) For consumer mobile broadband plans, the mobility testing should be conducted via a drive test for every measurement period. For both mobility and stationary testing, Specified ISPs should ensure that the drive test routes or test clients are evenly distributed geographically for any given measurement period and that these locations must change for subsequent measurement periods.

i) Mix of local and international websites/servers: Specified ISPs should ensure that their methodology includes a balanced mix of local and international websites/servers, such that the results are representative of their end users' local/international traffic patterns and experience.

j) Specified ISPs may outsource the design and implementation of the measurement of typical speeds, provided all the minimum parameters set by IDA are adhered to.

Additional Publication Requirements for Specified ISPs

27. In addition to the detailed information specified in paragraph 19 on the publication of the measurement and computation methodologies, Specified ISPs must also make publicly available the following information either at their websites or publications such as brochures:

a) the peak and off-peak periods when the measurements were taken for residential fixed broadband plans (to be updated if the periods change);

b) the general geographical locations of test clients for residential fixed broadband plans and stationary testing for consumer mobile broadband plans (e.g., Woodlands, Jurong, Orchard, Sengkang, Paya Lebar, etc);

c) a general description of the locations/test routes for mobility testing for consumer mobile broadband plans (e.g., Woodlands, Jurong, Orchard, Sengkang, Paya Lebar, etc); and

d) the time period or testing period for both stationary and mobility testing for consumer mobile broadband plans.

28. For broadband plans where separate theoretical local and international maximum download speeds are advertised, Specified ISPs are required to publish the typical local and international speeds separately, in all advertising materials and on their websites. In the event that Specified ISPs advertise only a theoretical local speed *or* theoretical international speed, IDA will allow the Specified ISPs to publish the corresponding typical local or typical international speeds only in all their advertising materials, so long as it is made clear in these materials. However, both the typical local and international speeds must be made available on the ISPs' websites with the fuller details of their measurement methodologies.

29. Additionally, for consumer mobile broadband plans, if Specified ISPs advertise only a theoretical stationary or theoretical mobility maximum download speed, IDA will allow Specified ISPs to publish the corresponding typical speeds from stationary or

mobility testing only in all their advertising materials, so long as it is made clear in these materials. In the event that Specified ISPs do not make a distinction between a stationary or mobility theoretical speed, then the ISPs may publish *either* the typical mobility *or* typical stationary speeds in all advertising materials. However, the typical speeds from both stationary and mobile testing (as single figures or as ranges) must still be published on the ISPs' websites. This will also apply to consumer mobile broadband plans that are advertised based on the same theoretical speeds (e.g., 7.2 Mbps) but are differentiated by the amount of bundled data usage only. All Specified ISPs must include weblinks or footnotes in their advertising materials to refer end users to the ISPs' website or publications where details on the typical stationary and mobility speeds and the most updated test results for both speeds can be found.

30. For clarity, the additional requirements for Specified ISPs are summarised in the table below:

	IDA's Additional Requirements for Specified ISPs
Additional Parameters that ISPs Must Measure and Publish	• If separate theoretical local and international maximum download speeds are advertised, Specified ISPs must publish the typical local and international speeds separately, in all advertising materials and at their websites. However, if Specified ISPs advertise *only* a theoretical local speed or theoretical international maximum download speed, IDA will allow the ISPs to publish the corresponding typical local or typical stationary speeds only in all their advertising materials, so long as both the typical local and international speeds are still made available on their websites. • For consumer mobile broadband plans, if Specified ISPs advertise *only* a theoretical stationary or theoretical mobility maximum download speed, IDA will allow Specified ISPs to publish the corresponding typical speeds from stationary or mobility testing only in all their advertising materials. If ISPs do not make a distinction between a stationary or mobility theoretical maximum download speed, then the ISPs may publish *either* the typical mobility *or* typical stationary speeds in all advertising materials. However, both the typical mobility and stationary speeds must still be made available on the ISPs' websites.

Additional Requirements for Publication of Measurement and Computation Methodologies at Websites	• The peak and off-peak periods when the measurements were taken for residential fixed broadband plans (to be updated if the periods change). • The general geographical locations of test clients for fixed residential broadband plans and stationary testing for consumer mobile broadband plans (e.g., Woodlands, Jurong, Orchard, Sengkang, Paya Lebar, etc). • A general description of the locations/test routes for mobility testing for consumer mobile broadband plans (e.g., Woodlands, Jurong, Orchard, Sengkang, Paya Lebar, etc). • The time period or testing period for both stationary and mobility testing for consumer mobile broadband plans.