



**BROADCASTING AND TELECOMMUNICATION  
(QUALITY OF SERVICE)  
REGULATIONS  
CONSULTATION PAPER**



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## **Responding to this consultation**

The Department of Information Communications Technology Communications Division has been reviewing the quality of service requirements in Seychelles and has engaged consultants to draft Regulations.

The Department now invites stakeholders such as the general public, Service Providers and other interested organisations to comment on the draft Regulations. Comments should be made in writing to

Department of Information Communications Technology Communications Division  
PO Box 737, Caravelle House, Victoria, Seychelles

or

[communications@ict.gov.sc](mailto:communications@ict.gov.sc)

within four (4) weeks after publication of this document.

The Department intends to hold a workshop to discuss the submissions and proceed towards its decisions. In making those decisions it will take into account, but will not be bound by, all of the submissions.

The Department and the consultants will be happy to discuss the draft Regulations with stakeholders during the consultation period. Stakeholders wishing to take up this opportunity should alert the above contact points as soon as possible.

Early in the review, Service Providers were invited to describe how they performed quality of service monitoring. The descriptions received, and the quarterly reports from the Service Providers to the Department, were taken into account in the draft Regulations, although to ensure confidentiality their influence is not highlighted.

The Consultation Paper includes some specific questions, but comments are invited on all parts of the draft Regulations, regardless of whether there are specific questions.

## **Consultation structure**

The Consultation Paper has the draft Regulations appended to it, and much of it has the same structure as the draft Regulations, for simplicity and clarity; for instance, there is a section headed “Interpretation” in it, just as there is in the draft Regulations. It is intended to expose some features of the draft Regulations without having further legal force, but it is not intended to paraphrase everything in the draft Regulations or to be self-contained.

## **Legal mandate**

The draft Regulations are issued in exercise of the powers conferred on the Minister by Section 38(1) of the Broadcasting and Telecommunication Act, 2000, read with Section 12(2)(b) of the Broadcasting and Telecommunication Act, 2000.

## **Introduction: the need for quality of service monitoring**

There is evidence that quality of service for broadcasting and telecommunications in Seychelles deserves attention. For instance:

- (a) Between 2011 and 2015 there were 28 complaints to the Fair Trading Commission about electricity or water and 156 about broadcasting or telecommunications; approximately one-third of the 156 concerned Telephony and two-thirds concerned Subscription Television. However, the position was better in 2015 than in earlier years: there were only twice as many complaints about broadcasting or telecommunications as about electricity and water.
- (b) Between 2011 and 2012, for example, there were criticisms by members of the National Assembly, comments in the Business Environment Forum and complaints to the National Consumer Forum about quality of service. The main problems discussed were service supply, faults, call failures, decoder availability and customer service deficiencies.
- (c) The figures for complaints to the Fair Trading Commission are not high, given the population of Seychelles, and reflect many differences between industries, but they suggest that quality could be improved. Moreover, they are likely to rise as people become more dependent on technology.

All of the Service Providers currently report quarterly to the Department quality of service Indicators and other figures. However, corresponding Measurements by different Service Providers might not be comparable with each other or auditable by the Department, because the Measurement Methods, and even some of the Measurement Results, are not defined precisely enough. Moreover, the Indicators do not provide information about Broadband Internet, which is growing in importance rapidly.

The Consumer Protection Act, 2010, Section 32(a) prohibits false representations that a service is “of a particular standard, quality, value or grade”. The Consumer Protection Act, 2010, Section 40(1)(b) requires that a service be performed “in a manner and of a quality that persons are generally entitled to expect”. Quality of service requirements can make the natures of these misrepresentations and requirements specific to broadcasting and telecommunications.

If customers have little choice among Services, quality of service requirements can help to ensure sufficiently high quality and sufficiently low prices to satisfy Customers. Targets in this case can reduce the likelihood that quality will fall towards levels that are widely agreed to be unsatisfactory, without limiting the choice between quality and price unnecessarily.

The quality of Services should be consistent with the prices charged by Service Providers, as well as with the claims made by Service Providers. Quality of service requirements should not prevent Customers from making choices, which might be to have low prices with low quality or high quality with high prices. Quality of service information can help Customers to make such choices: where a market is potentially competitive, publishing and publicising Measurement Results for different Service Providers can give Customers tools for choosing between Service Providers and encourage Service Providers to compete.

The quality of Services is important to Seychelles, as well as to individual Customers. The networks should be capable collectively of meeting national needs for emergency support, along with education and other development priorities. Quality of service information can help the government to determine whether the networks meet these needs.

## **Background: the nature of quality of service monitoring**

When there is a single Service Provider, regulation can protect customers against high prices and low quality and can protect potential competitors against anti-competitive practices. Such protection remains a major justification for quality of service requirements in many countries.

Markets have developed so that there are multiple Service Providers offering multiple Services over their own networks. When Customers can choose their Service Providers, regulation can protect them against false advertisements and unnecessary ties to particular Service Providers.

Markets have now developed further so that there are multiple Service Providers offering multiple Services over networks that they do not control. With Broadband Internet and smart phones, Customers can choose their Service Providers separately from their network providers. For instance, to make calls they can use an "Over-The-Top" Service, which needs the internet infrastructure but avoids as far as possible the application systems in the infrastructure.

"Over-The-Top" Service Providers often do not charge for their Services, so quality of service requirements are not needed for consumer protection. In addition, quality of service requirements could not be enforced on them, as they do not currently hold Licences. However, in future they might want Licences, to obtain the rights of licensees (such as holding phone numbers or radio frequencies, or having symmetric interconnection agreements). In acquiring rights they would also acquire responsibilities. Typically they will need Licences if they charge for their Services, because they will need the rights of licensees; charging for their Services will then make quality of service requirements and other consumer protection rules applicable.

As far as possible, quality of service requirements should avoid impeding competition between Service Providers that charge and other Service Providers. If quality of service requirements are very stringent, then these other Service Providers might have unreasonable competitive advantages and might be reluctant to extend their Services by obtaining Licences. However, the quality of service requirements in the draft Regulations are largely matters of good husbandry that many Service Providers already observe; consequently, these other Service Providers might choose to state that they observe them.

Service Providers are responsible for the quality experienced by Customers who pay them for communication paths. For instance, a Service Provider that offers calls from end points on the internet to conventional phones having phone numbers will recover its interconnection costs by charging for the calls and will need to observe the quality of service requirements over the end-to-end paths; accordingly it will need to ensure that the quality provided by the wholesale Services that it agrees to take is consistent with the quality required for its own retail Services. However, quality of service requirements are not appropriate if Customers do not pay: the quality might be low, but the prices are, too.

Thus quality of service monitoring should be seen as an aspect of consumer protection (where consumer protection is understood to include disaster management, for example). To contribute most effectively it needs to be suitably selective. For instance:

- (a) It should provide information that is comprehensible and relevant to Customers.
- (b) It should be specific enough to show the differences between Services that have important consequences for Customers and that can be perceived directly by Customers.
- (c) It should not burden Service Providers or the Department with reporting and auditing matters beyond those needed for consumer protection.
- (d) It should build on good practices already used successfully by the Service Providers.
- (e) It should not impede competition between Licensees and service providers who are not regulated and who offer free services (using the internet).

## **1. Citation**

This paragraph in the draft Regulations needs no explanation.

## **2. Interpretation**

Defined terms have initial capital letters, following widespread practice.

The crucial definitions are those of “Indicator” and “Target”. Indicators are quantities that can be measured to assess the quality of aspects of Services. Targets are values of Indicators that are regarded as satisfactory for some purposes. In other documents there are alternative words for “indicator” and “target”, such as “parameter” (for “indicator”) and “benchmark”, “threshold” or “objective” (for “target”).

## **3. Application**

The draft Regulations impose obligations on Service Providers that require payments by the members of the general public to whom they provide their Services. They do not impose obligations on Service Providers that derive their revenues purely from commercial advertising, government funding or sales to other Service Providers. Such Service Providers may choose to observe the requirements in the draft Regulations, but they are not obliged to do so.

The Service Providers that observe the requirements in the draft Regulations, by choice or obligation, constitute the “Participating Providers” in the draft Regulations. However, to avoid unfamiliar terms, elsewhere the Consultation Paper refers to “Service Providers”, not “Participating Providers”. For similar reasons it refers to “the Department [of Information Communications Technology]”, not “the Minister”.

## **4. Measurement coverage**

Measurements should be made for an indicator in accordance with the Measurement Method prescribed for the Indicator in the draft Regulations. The Measurements can then be combined to form a Measurement Result, which is a value of the Indicator that can be reported. The Measurement Result should usually be formed from all of the Measurements made, because otherwise the least satisfactory Measurements might be removed.

Indicators are intended to differentiate between Services if quality is likely to differ perceptibly between the Services. However, different Services provided by the same Service Provider might be so similar to each other that the same value of an Indicator can be used when assessing quality for all of them. In that case the Services can be treated the same as each other for the purpose of making Measurements of that Indicator: they can be in the same Measurement Domain as each other and one Measurement Result can be enough for all of them.

Measurements are made by performing Field Tests or by collecting System Readings that covering the Reporting Periods and Reporting Areas. Field Tests should be performed at particular times and places that might be those of users, but need the co-operation of the users if those places are in houses and offices. System Readings covering all times can be collected inside a network without special tests, but might not count deficiencies in Services occurring in the places where users might be.

Field Tests typically depend on sampling, as testing can be done in only some of the times and places that might be those of users. System Readings might also depend on sampling, as otherwise collecting them might be too laborious. In both cases samples should be Representative Samples.

## 5. Measurement planning

Measurements are comparable between different Service Providers and auditable by the Department only if the Measurement Methods are defined adequately. In particular, variations in implementation should be small enough not to matter to Customers.

Whether made by performing Field Tests or by collecting System Readings, Measurements for different Service Providers should be comparable with each other. Field Tests for different Service Providers should be matched, so that they are performed at similar (or, better, the same) times and places. System Readings for different Service Providers should be analysed to ensure that the calculations using data from different systems, possibly from different vendors, produce equivalent results.

## 6. Measurement reporting

The quality of a Service should be assessed in each Reporting Area by obtaining new Measurement Results. The Measurement Results, and any required supplementary information, obtained during each Reporting Period should be passed to the Department. The Management Results would be published; the supplementary information might not be, because it is not very useful to the general public, but it would be useful in audits of the records kept by the Service Providers.

## 7. Citation

This paragraph in the draft Regulations needs no explanation.

## 8. Measurement publication

Measurement Results should be published to help customers to make informed choices. The most satisfactory approach at the moment seems to be that the Service Providers publish on their web sites the most recently approved Measurement Results, in formats agreed by the Department, along with any approved explanatory remarks on topics such as those listed in the draft Regulations.

*What else should approved explanatory remarks cover?*

The Department should publish its own test results, and publicise through the press and broadcasters any especially striking conclusions from any of the results. However, in the draft Regulations there is no requirement for the Department to make Measurements or to publish Measurement Results. An alternative arrangement would be for the Department to make all of the Measurements that would be combined for publication by the Department as the approved Measurement Results. This arrangement could ensure that the Measurements were comparable between different Service Providers and did not need to be audited; however, it would lead to duplication of effort (if the Service Providers continued to make their own Measurements) and depend heavily for its success on government resource allocation.

*Should Service Providers be responsible for publishing the approved Measurement Results and making the relevant Measurements?*

Measurement Results are intended to be presented clearly and exactly enough to let Customers compare different Services fairly. In particular, they should be presented differently from each other only if they are perceptibly different to Customers. To assist with this, they might be expressed to at most two significant figures (because any more figures could wrongly suggest high precision). They might also be written in such a way that “good” values have low percentages or times (because people perceive the difference between “1%” and “2%” more readily than the difference between “99%” and “98%”).

*What else should be considered for presenting the information to Customers?*

## **9. Field Tests**

Campaign Tests are Field Tests that require actions by, or on behalf of, Service Providers or the Department to be planned for particular times and places: test equipment should use wired or wireless connections to the networks like those that a Customer would need. Campaign Tests for Mobile Access are often drive and walk tests, with assumptions about extending the results from publicly accessible places such as shops and halls into houses and offices; Campaign Tests for Fixed Access are often performed in the buildings or cabinets of the Service Providers, to avoid needing access to houses and offices.

Crowd Tests, using “crowd sourcing” techniques, are Field Tests that can be alternatives to Campaign Tests: the terminals of users, or test equipment distributed to users, make measurements that collectively are indicative of user experience. Such tests do not involve Measurement Agents and are not matched for different Service Providers: they are done whenever and wherever the terminals are present, and they might or might not be initiated by the users. They require the users to permit, or even welcome, measurements, so they capture the experience of only some, specialised, users. Crowd Tests for Mobile Access require smart phones; Crowd Tests for Fixed Access require test equipment, unless Fixed Access connections through smart phones and licence-exempt radio frequencies become commonplace (or unless the overheads of execution on personal computers are diminished greatly) .

The Department can encourage users to install Crowd Test programs, by first ensuring that its employees do so and then requesting government agencies, at both national and local levels, to ensure that their employees do so. If necessary, users could be given incentives, such as payments to cover data allowances or cheap smart phones.

*What else would encourage the installation of Crowd Test programs?*

## **10. Measurement Agents**

Campaign Tests for Mobile Access might be performed by a Measurement Agent that tests the Services of all of the Service Providers at the same times and places; measurements would thereby become cheaper to make and easier to compare. A Measurement Agent should make its capabilities available without discrimination between Service Providers, so that all of them can benefit from economies of scale and scope.

The Department can encourage Service Providers to appoint jointly a Measurement Agent, by offering to be a Measurement Agent itself, convening meetings of the Service Providers, proposing ways of cost sharing (according to the quantities of measurements performed on behalf of each Service Provider, for example), and ensuring that the joint appointment does not involve collusion or the unfair exclusion of other Service Providers.

*What else would encourage the joint appointment of a Measurement Agent?*

## **11. Reporting Periods**

Improvements in services often require improvements in networks. Consequently they need to be assessed only on a timescale like that for bringing about improvements in networks; more frequent reporting could place unnecessary reporting burdens on Service Providers and unnecessary auditing burdens on the Department. Conversely, though some improvements might depend on budgetary cycles and equipment deliveries that take many months, other improvements can be made fairly rapidly. Overall a Reporting Period of three (3) months between reports by the Service Providers seems appropriate in Seychelles, as in many other countries. It is used for the current quarterly reports, but the Service Providers have not always delivered those reports within a month after the end of the quarter, as the draft Regulations require.

*Should the Reporting Periods be adjusted in any way?*

## **12. Reporting Areas**

The operations systems of Service Providers can identify the islands in which nodes are located but might have no information about how much traffic through a node at the edge of an island is generated in other, nearby, islands. In that case the node would need to be regarded for Measurements as if it served only the island occupied by the highest proportion of its users.

Improvements in networks might affect one location more than another; there could be significant differences in quality within islands as well as between islands. The draft Regulations distinguish just between islands, but a finer distinction (between administrative districts, for example) might be feasible without excessive effort. Also, some locations might justify particular quality of service monitoring when networks are being improved.

*Should different districts within islands be in different Reporting Areas?*

## **13. Representative Samples**

Representative Samples should not be biased in favour of particular times and places for Measurements far beyond the extent to which the proportions of traffic at those times and places justify such bias.

Representative Samples should be small enough to permit Indicators to be measured without excessive cost, and large enough to detect, with good confidence, important differences in quality that can be perceived directly by Customers.

The minimum size of a Representative Sample in the draft Regulations discriminates between Measurement Results that differ by at least one (1) percentage point when the better of them could be regarded as having five (5) stars (or as being “excellent”) and between Measurement Results that differ by at least four (4) percentage points when the better of them could be regarded as having two (2) stars (or as being “poor”). Quadrupling the minimum size would approximately halve the interval of uncertainty, and therefore the imprecision, around the Measurement Result.

*Should the minimum size of a Representative Sample be decreased, to reduce the time and effort needed, or increased, to improve the precision?*

## **14. Cost recovery**

The simplest cost recovery mechanism lets Service Providers deal with their own costs. These costs could bear heavily on new and small Service Providers, who are not exempted from making Measurements in the draft Regulations. The motivation for not exempting such Service Providers is that customer protection should be provided regardless of the Service Provider. However, new and small Service Providers stimulate competition and increase choice, so they can benefit Customers and should not have barriers placed in their way unnecessarily; also, their initial Customers can appreciate that they might require time to refine their systems after launching their Services. Hence there is a good case for exempting Service Providers from quality of service requirements until they have, say, 10% of the market in a Reporting Area.

*Should new and small Service Providers be exempted from requirements to make Measurements?*

## **15. Governance**

Working groups can be useful for resolving problems, clarifying details and harmonising procedures (such as those in measurement application control scripts). However, in other countries they have sometimes delayed the effective introduction of regulatory measures when they have been left to themselves. Hence the Department will take into account the opinions expressed in working groups but will remain responsible for determining quality of service requirements.

The Measurement Methods in the draft Regulations contain several details that the Department may change without formal consultation with the public if the changes do not affect substantially the costs of compliance. The intention is to keep pace with rapid developments that do not change quality of service monitoring fundamentally; for instance, though Campaign Tests can use the time periods and protocols given as details for the Indicators for Broadband Internet in the draft Regulations, Crowd Tests might not do so, because their details are determined by the suppliers of the Crowd Test programs.

*Which quantities should be open to change without formal consultation with the public?*

## **16. Dispute resolution**

Service Providers and Measurement Agents might resolve any disputes among themselves without recourse to external intervention. However, the Department will duly investigate any complaint made to it and take actions to resolve the dispute.

In other countries disputes about quality of service have arisen when one Service Provider has made claims about its quality of service that another Service Provider does not regard as justifiable. To some extent such disputes can be mitigated by requiring that published Measurement Results have at most two significant figures and are accompanied only by remarks approved by the Department.

*What else would help to avoid disputes between Service Providers about Measurement Results?*

## **17. Customer awareness**

One way in which a Service Provider can promote awareness of the Indicators and Targets is by providing to its Customers service level agreements that state its quality of service objectives (including any of its own that are more demanding than those due to regulation). These agreements would be among the contractual terms and might be distributed to Customers by mail and electronic messages. However they would lengthen the contractual terms, which are already too long to be read, and duplicate the Measurement Results that would be published by the Service Providers

*Should Service Providers be encouraged, or even required, to provide explicit service level agreements to their Customers?*

## **18. Sanctions**

The draft Regulations provide graduated sanctions. Simply publishing comparative values of Indicators might stimulate improvements. Failing that, requiring the implementation of improvement plans might do so. However, further sanctions might be needed, especially if the Service Provider has Significant Market Power (so competition could be insufficient to stimulate improvements), is not implementing agreed improvements or is letting quality fall towards levels that are widely agreed to be unsatisfactory.

The Department can take into account the environmental, financial and operating circumstances of Service Providers when applying sanctions. Nonetheless in principle Customers should have the same rights and receive the same information regardless of their Service Providers.

Targets are especially applicable to a Service Provider that has Significant Market Power in the markets for the relevant Services: without them the Service Provider might let quality fall consistently to levels that are generally agreed to be unsatisfactory. However, Targets can also provide guidance where competition is strong enough to maintain quality or to allow quality to be traded off against price, in which case they should not limit choices between quality and price unnecessarily.

*Should the factors and circumstances limiting sanctions be made more or less rigorous in any way?*

## Schedule

### Indicators for all Services with Fixed Access

Just as in various other countries where mobile access predominates, in Seychelles Fixed Access could be a major main generator of complaints to the Service Providers. The most basic problems are often with service supply time and fault repair time. These are not nearly so important if there is Mobile Access (or even if the Fixed Access Services adopt (mobile) Access Technologies). For Mobile Access the Indicator of accumulated downtime appears to be more suitable.

*Should the Indicators of service supply time and fault repair time be extended to Mobile Access?*

The Indicators of service supply time and fault repair time in the draft Regulations distinguish between residential Services and business Services, just as do the current quarterly reports. However, a Service Provider might offer more than two levels of service, and other Indicators could be given distinct values for these distinct levels of service.

*Which Indicators and Targets should distinguish between levels of service?*

The Indicator of service supply time is given very different values in the current quarterly reports by different Service Providers. These differences might reflect differences in assumptions about when potential Customers are considered to be inside the serving area or about how much equipment needs to be installed in cabinets or elsewhere. The serving area in the draft Regulations is estimated from house densities in urban peripheries, in the absence of information on equipment locations.

*How should the Indicator of service supply time reflect the requirement that the service be available in the locality of the Customer?*

### Indicators for all Services with Mobile Access

The availability of Fixed Access networks can be determined from their fault report rates and fault repair times (at least if all faults are counted exactly once). The availability of Mobile Access networks can be determined similarly, by reference to failures of base stations. However, the availability determined in this way does not represent user experience of Mobile Access network faults fully, because, even if an entire base station fails, users who would otherwise receive their strongest signals from that base station might simply be served by another base station, at least until that base station becomes overloaded. Restricting attention to outages affecting several people and lasting some time, as in the Indicator of community isolation, might represent user experience better. However, the size of a community and the duration of an outage in the Measurement Method might not be the best possible, and a standard notion of availability might be easier for users to appreciate.

*Which Indicator of community isolation should be adopted?*

Coverage is assessed in Field Tests, not from planning tools. Planning tools differ in vendor, configuration and assumptions (about the propagation model, cell utilisation, population distribution and terrain, for example); usually they do not capture local variations realistically, even if they are updated according to Service Provider inspections. For instance, in the UK, where the regulator lays down several assumptions for the planning tools, in a test of one area the signal strength measured in Field Tests was sometimes higher and sometimes lower than that predicted by planning tools by up to 39 dB.

*How could planning tools, with their inspection and update processes, be adapted to provide results that were comparable between Service Providers and close to those of Field Tests?*

Coverage is assessed in terms of signal strengths, which are characterised by making measurements of quantities specific to particular Access Technologies. The thresholds proposed for signal strengths are related to those in other countries, in the absence of evidence about the particular conditions of Seychelles. They are intended to let moderately good support be provided to voice calls and data transfers. They are in effect raised by 10 dB for locations that are outdoor and stationary, because such locations are taken to be substitutes in tests for indoor or moving locations, where the received signal can be attenuated by 10 dBm.

*What evidence is there about the signal strengths suitable for ensuring successful voice calls and data transfers, both outdoors and indoors, at urban and rural locations in Seychelles?*

Because of co-channel interference and congestion, high signal strengths do not guarantee successful voice calls and data transfers. Coverage might therefore be assessed not in terms of signal strengths but instead by reference to aspects of Services directly perceptible to users, such as the percentage of locations where, irrespective of the signal bars displayed by the phone, voice calls are set up and maintained for two (2) minutes or data transfers incur at most 1% packet loss. However, coverage might then appear to vary with the level of congestion (for Access Technologies such as CDM2000 and UMTS that entail “cell breathing”). Moreover, it would not be available in many measurement applications (especially Crowd Test programs).

*Should the Indicator of coverage be defined by reference to aspects of Services directly perceptible to users instead of by reference to signal strengths?*

## **Indicators for Telephony with Mobile Access**

The Indicators for Telephony in the draft Regulations depend on Measurements made by collecting System Readings, because appropriate network statistics are readily available. They could be made by performing Campaign Tests at the same times and places as the drive and walk tests used for the assessment of coverage; doing this would let them assess radio network effects on call quality but would complicate any future use of Crowd Tests, as voice calls are not usually tested in Crowd Test programs.

*Should Measurements be made for Telephony by performing Field Tests instead of by collecting System Readings?*

The Indicators for Telephony in the draft Regulations are required only if there is Mobile Access. For Fixed Access in recent years unsuccessful call setups and dropped calls have been rather infrequent, so these Indicators have not been required. However, the use of network facilities like the internet infrastructure can reduce call quality, so there might now be a case for requiring these Indicators if there is Fixed Access. Moreover, some Fixed Access Services actually adopt (mobile) Access Technologies, with the associated deficiencies that might manifest themselves in unsuccessful call setups and dropped calls (not as problems with Service supply and restoration, which other Fixed Access Services might have).

*Should the Indicators of unsuccessful call setups and dropped calls be extended to Fixed Access?*

The Indicators for Telephony relate to end-to-end paths that can traverse more than one network, because Customers are paying for such paths. If they related only to paths to on-net destinations they would be uninformative to Customers and inapplicable to “Over-The-Top” Service Providers; they would need to be accompanied at least by Indicators concerned with the absence of congestion on interconnections, which would be difficult for Customers to use and lead to confusion with the service level agreements between Service Providers.

*Should the Indicators of unsuccessful call setups and dropped calls be replaced by, or supplemented with, versions relating to paths to on-net destinations only or with versions relating to interconnections?*

Whether different Services are regarded by Customers as different can affect whether the Measurements made for them should be different. For instance, if Customers differentiate between Access Technologies (such as GSM and UMTS), then the successful call setups for each Access Technology might be counted separately. Thus Services are put in the same Measurement Domain for an Indicator unless they are widely regarded as different or produce perceptibly different Measurement Results. In particular, the Indicators for Telephony in the draft Regulations assume that Customers do not differentiate between circuit-switching and packet-switching or between GSM and UMTS; in this respect they are neutral about technology, fit the practice in the current quarterly reports by the Service Providers and conform with the widespread network technique of falling back from UMTS to GSM when the UMTS coverage is deficient. However, for these or other Indicators, there could be cases for treating different technologies differently.

*Which Indicators and Targets should distinguish between circuit-switching and packet-switching or between different Access Technologies?*

No Indicator of speech quality is specified in the draft Regulations. There are standard measurement tools for speech quality, following International Telecommunication Union Recommendation P.563 for Fixed Access and P.862 or P.863 for Mobile Access, as well as proprietary ones. However, the currently available evidence does not suggest that speech quality is, or is likely to become, unsatisfactory in Seychelles.

*Should an Indicator of speech quality be introduced for Mobile Access or indeed for Fixed Access?*

## **Indicators for Broadband Internet with Fixed Access or Mobile Access**

The Indicators for Broadband Internet in the draft Regulations depend on Measurements made by performing Field Tests. Ideally these Field Tests would be performed where Customers use the Services. However, doing this could entail gaining access to houses and offices, attaching special equipment in houses and offices or operating special applications on customer equipment. All these possibilities require the consent of the Customers; they can also be inconvenient, expensive or liable to produce misleading results. Consequently, for Fixed Access the Field Tests are likely to be Campaign Tests performed in the buildings or cabinets of the Service Providers; for Mobile Access, the Field Tests are likely to be Campaign Tests or Crowd Tests performed at the same times and places as the drive and walk tests used for the assessment of coverage, with the use of Campaign Tests envisaged until Crowd Tests become common enough.

*What conditions should be fulfilled before Crowd Tests can replace Campaign Tests?*

The Indicators for Broadband Internet in the draft Regulations depend on Measurements of data transfers from and to two international end points. They could obviously be extended to data transfers from and to a national end point. However, without local caches, many data transfers, other than those for the Domain Name System, are likely to have international end points

*Should the Indicators for Broadband Internet depend on Measurements of data transfers from and to national end points as well as, or even instead of, international end points?*

The Indicators for Broadband Internet in the draft Regulations do not distinguish between the technologies used for Fixed Access or for international connectivity (such as cable and satellite) but distinguish between different technologies for Mobile Access. In the draft Regulations Broadband Internet Services must be advertised as having particular Data Transfer Rates or as adopting particular (mobile) Access Technologies. Thus the Fixed Access Services are advertised as having particular Data Transfer Rates, but the Mobile Access Services might be advertised instead as adopting particular Access Technologies.

*Should the Indicators for Broadband Internet make distinctions between Services other than those according to Data Transfer Rates and Access Technologies?*

The Indicators for Broadband Internet in the draft Regulations do not distinguish between cable and satellite in International connectivity. However, the latencies are likely to be very different in the two cases: for cable a Target for the latency might be 200 milliseconds, though for satellite it could not be less than 500 milliseconds. Conventionally voice conversations are thought to suffer in quality if there are one way delays of 150 milliseconds. Thus though a distinction between cable and satellite in international connectivity would not be neutral about technology it would have some merit, at least if there were Targets about latency.

*Which Indicators and Targets should distinguish between cable and satellite international connectivity?*

The Indicators for Broadband Internet in the draft Regulations are limited to those that could be calculated using the results from various measurement applications (especially Crowd Test programs); perhaps the most basic omission from them is any test of the Domain Name System, which is fundamental to all internet functions. Nonetheless, they characterise quite well the quality of several internet functions (such as file transfer, video streaming, messaging and gaming). Indicators could be devised for particular functions, but several might be needed in order to maintain a consistent depth of treatment across all the functions; for instance, there are two sets of functions for video streaming, and each might need its own Indicators. There are now also measurement tools for video quality, following International Telecommunication Union Recommendation J.343, somewhat like those for speech quality. In general, internet functions continue to proliferate, and this proliferation could lead to a proliferation of Indicators, when users probably consider very few.

*Should the Indicators for Broadband Internet be supplemented with ones for particular internet functions?*

The Indicator of throughput in the draft Regulations requires reports of the mean speeds attained in the tests; means (as opposed to quantiles, for example) are used because they are probably well understood by the general public. An alternative Indicator would require reports of the proportions of tests that achieve at least 90% of the advertised speeds; it might be more informative for Customers, but it would require speeds to be advertised, which is not often done for mobile Broadband Internet. Both these Indicators could be extended to deal with “up from” speeds as well as “up to” speeds; for instance, there could be requirements to report the highest speeds attained in the worst 10% of the tests or the proportions of tests that achieve at most 10% of the advertised speeds. Such extended Indicators could replace the statements of minimum speeds currently required in descriptions of Broadband Internet Services.

*Which Indicator of throughput should be adopted?*

## **Indicators for all Services with Fixed Access or Mobile Access**

The Indicators of service complaints in the draft Regulations are appropriate in the absence of general legal quality of service requirements relating to customer service. They are the same for all Services where they are independent of the natures of the Services.

*Should there be further Indicators for customer service?*

The Indicators of service complaints in the draft Regulations aim to make clear distinctions between particularly important topics of service complaints but to combine those topics listed in the current quarterly reports that the Service Providers do not use much. However, in the draft Regulations fault reports are currently not regarded as service complaints, despite the potential confusion with them. The topics of service complaints that are identified separately should be exhaustive enough that few complaints (10% of them, say) need to be labelled as “Other”. Moreover, there is a case for adopting consistent topics in several industries (especially utilities) to simplify comparisons between industries.

*Which topics of service complaints should be identified separately?*

The distinction between fault reports and service complaints is widespread in quality of service monitoring and is present in the draft Regulations. However, in the current quarterly reports it seems to be interpreted differently by different service providers.

*How (if at all) should the distinction between fault reports and service complaints be made?*

## **Annex: the draft Regulations**



**BROADCASTING AND TELECOMMUNICATION  
(QUALITY OF SERVICE)  
REGULATIONS**



## Arrangement of regulations

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1. These Regulations may be cited as the Broadcasting and Telecommunication Citation (Quality of Service) Regulations, 2016.

2. (1) The meanings of terms and abbreviations for terms laid down in the Interpretation Broadcasting and Telecommunication Act, 2000, apply also in these Regulations unless the context or a definition in these Regulations indicates otherwise.

(2) In these Regulations:

**“Access Technology”** means a class of closely related transmission techniques; the classes are GSM (with its variants GPRS and EDGE), UMTS (with its variants WCDMA and HSPA) and LTE (with its variants LTE-A and LTE-U).

**“Broadband Internet”** means the class of Services in which a Service Provider, in return for payments by the Customers that receive the Services, supports data transfers between the terminals or premises of Customers and a public network that have a Data Transfer Rate of at least 256,000 bits per second in some conditions according to either advertising for the Services or expectations for the Access Technologies used by the Services.

**“Campaign Test”** means a Field Test performed by, on or behalf of, the Minister or a Service Provider at a time and a place determined in outline by a plan.

**“Crowd Test”** means a Field Test performed with the aid of the equipment of a Customer at a time and a place matching those of the equipment.

**“Customer”** means a natural or legal person provided a Service by a Service Provider under a contractual relationship.

**“Data Transfer Rate”** means the speed at which data is transferred, as calculated by dividing the quantity of data transferred by the time taken to transfer the data.

**“Downlink”** means the direction in which data is transferred to the equipment of a Customer.

**“Field Test”** means a test of access to communications initiated at a time and a place that might be those of a Customer using a Service.

**“Fixed Access”** means the class of Services that are not designed to let Customers continue perceptible access to communications while moving within the area for which the Service Provider holds a Licence.

**“Indicator”** means a measurable characterisation of the quality of an aspect of a Service.

**“Licence”** means a document issued by the Minister to authorise the provision of a Service by a Service Provider.

**“Measurement”** means a measurement of an Indicator made according to a Measurement Method for the Indicator.

**“Measurement Agent”** means an agent appointed to make Measurements on behalf of Service Providers or the Minister.

**“Measurement Domain”** means a class of Services such that the quality of a particular aspect of the Services is not likely to differ perceptibly between the Services.

**“Measurement Method”** means a method prescribed by the Minister for measuring an Indicator.

**“Measurement Result”** means the value of an Indicator obtained by making Measurements.

**“Minister”** means the minister responsible for broadcasting and telecommunication.

**“Mobile Access”** means the class of Services that are designed to let Customers continue perceptible access to communications while moving within the area for which the Service Provider holds a Licence.

**“Participating Provider”** means a Service Provider that undertakes or is legally obliged to comply with these Regulations.

**“Reporting Area”** means an area for which the Minister requires a Participating Provider to report Measurement Results.

**“Reporting Period”** means a period of time for which the Minister requires a Participating Provider to report Measurement Results.

**“Representative Sample”** means a collection of Measurements that the Minister requires to be made at different times and places in order to represent a Reporting Period and a Reporting Area adequately.

**“Service”** means a broadcasting or telecommunication service in Seychelles.

**“Service Provider”** means an organisation that provides a Service to the general public or to other Service Providers.

**“Significant Market Power”** means economic strength such that a Service Provider can behave to an appreciable extent independently of competitors, Customers and end users.

**“Subscription Television”** means the class of Services in which a Service Provider, in return for payments by the Customers that receive the Services, provides visual content according to a programme schedule.

**“System Reading”** means a reading obtained from data accumulated without special tests in the network or support systems of a Service Provider.

**“Target”** means a value of an Indicator that signifies a satisfactory level for the quality of the aspect of a Service characterised by the Indicator.

**“Telephony”** means the class of Services in which a Service Provider, in return for payments by the Customers that receive the Services, supports voice calls between the terminals or premises of Customers and a public network.

**“Uplink”** means the direction in which data is transferred from the equipment of a Customer.

(3) In these Regulations:

**“dBm”** abbreviates decibel milliwatt.

**“EDGE”** abbreviates Enhanced Data rates for GSM Evolution.

**“ETSI”** abbreviates European Telecommunications Standards Institute.

**“GPRS”** abbreviates General Packet Radio Service.

**“GSM”** abbreviates Global System for Mobile communications.

**“HSPA”** abbreviates High Speed Packet Access.

**“HTTP”** abbreviates HyperText Transfer Protocol.

**“ICMP”** abbreviates Internet Control Message Protocol.

**“km”** abbreviates kilometre.

**“LTE”** abbreviates Long Term Evolution.

**“RSCP”** abbreviates Received Signal Code Power.

**“RSRP”** abbreviates Reference Signal Receive Power.

**“RSSI”** abbreviates Received Signal Strength Indicator.

“TCP” abbreviates Transmission Control Protocol.

“UDP” abbreviates Unit Datagram Protocol.

“UMTS” abbreviates Universal Mobile Telecommunication Service.

“WCDMA” abbreviates Wideband Code Division Multiple Access.

3. (1) These Regulations apply to all Service Providers that hold Licences, Application regardless of whether they operate their own networks and their Licences contain quality of service requirements.
- (2) Every Service Provider may be a Participating Provider. It shall be a Participating Provider if it holds a Licence and provides a Telephony, Broadband Internet or Subscription Television Service to the general public in return for payments from the Customers that receive the Service.
4. (1) From six (6) months after these Regulations come into effect, in every Measurement Reporting Period and in every Reporting Area every Participating Provider coverage shall arrange that Measurements are made for each Measurement Domain of each Indicator applicable to a Telephony, Broadband Internet or Subscription Television Service of the Participating Provider and defined in the Schedule to these Regulations.
- (2) Every Participating Provider shall ensure that each of its Measurement Results is formed from all of the Measurements made for that Measurement Result in one (1) Measurement Domain, one (1) Reporting Period and one (1) Reporting Area, unless the Minister approves omissions on the grounds of inaccuracy, irrelevance or obsolescence.
- (3) Every Participating Provider shall arrange that Measurements are made by performing Field Tests or collecting System Readings as required by the relevant Measurement Method in the Schedule to these Regulations.
- (4) Every Participating Provider shall ensure that if a Measurement Method involves sampling, then the corresponding Measurements form a Representative Sample, unless the Minister approves shortcomings on the grounds of practicality.
5. Before the beginning of every Reporting Period every Participating Provider Measurement shall submit to the Minister the plan of approximately when and where it planning expects its Measurements to be made. The Minister may request revisions to the times and places of the Measurements to make them more directly comparable with those of other Participating Providers or make them more adequately representative of expected user experience.
6. Within one (1) month after the end of every Reporting Period every Measurement Participating Provider shall report to the Minister for every Reporting Area its reporting Measurement Results for that Reporting Period, with formats approved by the Minister and with any supplementary information required in the Schedule to these Regulations.

7. Every Participating Provider shall make a senior manager responsible for validating, and holding records about, its Measurements. The records shall be held for at least twelve (12) months after the Reporting Period to which they apply and shall include details of the observations and calculations, and any fault reports or service complaints, on which the Measurements depend. The Minister may inspect the records in order to audit the Measurement Results or refine the detailed obligations implicit in Measurement Methods Record keeping
8. (1) Every Participating Provider shall display in a prominent position on its web site certain Measurement Results and any associated explanatory remarks. The Measurement Results and the associated explanatory remarks thus displayed shall include those most recently approved by the Minister; any others displayed shall be marked clearly as being unapproved and shall not include any that the Minister has refused to approve. Measurement publication
- (2) The Minister will endeavour to be expeditious in granting or refusing approval of the Measurement Results and the associated explanatory remarks displayed by the Participating Providers. Approval processes will consider both the contents and the formats and may entail collating information from new Field Tests or inspecting the records about Measurements held by the Participating Providers.
- (3) The subjects of the explanatory remarks associated with Measurement Results may include, but are not limited to:
- (a) Failures to reach Targets.
  - (b) Deficiencies in Services that are due wholly or partly to other Service Providers.
  - (c) Changes in environmental, financial or operating circumstances that could not have been reasonably foreseen.
  - (d) The times and places where the Measurements were made.
  - (e) Expectations about quality that are appropriate to the pricing of the Services.
  - (f) The suitability of the Services for particular communication applications, given the Measurement Results.
- (4) The Minister may display in a prominent position on a web site, and publicise through the press and broadcasters, the Measurement Results of Participating Providers or the Minister or the outcomes of surveys and reviews of complaints.
9. (1) Every Participating Provider shall use Campaign Tests for any required Field Tests, unless the Minister approves instead the use of Crowd Tests executed by Crowd Test programs recommended by the Minister. Field Tests
- (2) Every Participating Provider shall arrange that Campaign Tests performed by, or on behalf of, it use wired or wireless connections like those that Customers would use and are planned to be performed at times and places which they expect to be like those that Customers would use.

- (3) The Minister may recommend, and encourage the use of, particular Crowd Test programs that are known to provide accurate data and are expected to become used consistently at many times and places.
  - (4) Every Participating Provider shall promote the use by its current and prospective Customers of Crowd Test programs recommended by the Minister.
10. (1) The Participating Providers may appoint jointly a Measurement Agent to perform Campaign Tests for Mobile Access on their behalf. That agent shall have identical fair and non-discriminatory service level agreements with them and shall be willing to offer such agreements to other Participating Providers on the same terms. Agents
- (2) The Minister will encourage the Participating Providers to appoint jointly a Measurement Agent that will ensure that the Campaign Tests for Mobile Access are comparable between the Participating Providers.
  - (3) The Minister may perform Campaign Tests or appoint a Measurement Agent to perform Campaign Tests on behalf of the Minister, in order to audit the Measurement Results reported by the Participating Providers or investigate quality at particular times and places.
11. Every Reporting Period shall start on the same day for all Participating Providers and shall last three (3) months, from the first day of the first month to the last day of the third month, unless the Minister determines otherwise. Reporting Periods may be smaller than this if the Minister considers that quality is likely to differ significantly over smaller periods. Reporting Periods may be larger than this if the Minister considers that quality is unlikely to differ significantly over larger periods. Reporting Periods
12. (1) For the purpose of making Measurements every node in the network of a Participating Provider shall be regarded as being in the Reporting Area nearest to where the Participating Provider expects most of the users served directly by the node to be. The Participating Provider shall inform the Minister if the node is not located in that Reporting Area. Reporting Areas
- (2) Mahé, Praslin and La Digue shall constitute the only three Reporting Areas, unless the Minister determines otherwise. Reporting Areas may be smaller than these if the Minister considers that quality is likely to differ significantly over smaller areas. Reporting Areas may be larger than these if the Minister considers that quality is unlikely to differ significantly over larger areas.
13. (1) Every Representative Sample shall include Measurements made in every hour of the working day. At most 20% of the Measurements shall be made in any one (1) hour of the working day and at most 20% of the Measurements shall be made on any one (1) working day. Representative Samples
- (2) Every Representative Sample shall include Measurements made in every administrative district in the Reporting Area, except for any omissions approved by the Minister. At least 2% of the Measurements shall be made in any one (1) administrative district that is not omitted.

- (3) The size of a Representative Sample shall be at least 384. For each Indicator defined as a percentage in these Regulations there is then (in certain conditions) a confidence level of 95%, amounting to nineteen (19) chances out of twenty (20), that the true value of the Indicator can be approximated by Measurement Results, in the sense that:
- (a) The true value of the Indicator is within 1% of Measurement Results that lie between 0% and 1% (or 99% and 100%).
  - (b) The true value of the Indicator is within 2% of Measurement Results that lie between 1% and 4% (or 96% and 99%).
  - (c) The true value of the Indicator is within 3% of Measurement Results that lie between 4% and 10% (or 90% and 96%).
  - (d) The true value of the Indicator is within 4% of Measurement Results that lie between 10% and 20% (or 80% and 90%).
  - (e) The true value of the Indicator is within 5% of Measurement Results that lie between 20% and 50% (or 50% and 80%).
14. Every Participating Provider shall cover its own costs of complying with these Regulations. Cost recovery
15. (1) The Minister may establish and chair working groups to discuss quality of service requirements, such as the detailed obligations implicit in Measurement Methods specific to particular operational processes and systems. Governance
- (2) Every Participating Provider may take part in such working groups. It shall take part if the Minister requests that it does so.
- (3) The Minister will subject to formal consultation with the public any proposed changes to quality of service requirements that would affect substantially the costs to Participating Providers of complying with these Regulations or the Licences.
16. (1) Every Participating Provider shall use its best endeavours to avoid and resolve any disputes with other Participating Providers and any Measurement Agent. Dispute resolution
- (2) A Participating Provider, or a Measurement Agent, may ask the Minister to investigate and take actions to resolve disputes.
17. (1) Every Participating Provider shall promote awareness among its current and prospective Customers of the Indicators and Targets. In addition, for each of its Broadband Internet Services it shall identify either a pair of Downlink and Uplink Data Transfer Rates or an Access Technology, along with any likely constraints on the applicability of the Service. Customer awareness
- (2) The Minister may conduct surveys of Customers and reviews of complaints by Customers in order to find how Services are perceived and consider whether these Regulations need revision.
18. (1) Any Participating Provider shall have committed a contravention if it fails to comply with these Regulations or to satisfy requirements arising from sanctions that the Minister has already applied. Sanctions

- (2) The Minister may apply the following sanctions if a Participating Provider commits a contravention:
  - (a) Requiring the publication of information about quality with contents and formats determined by the Minister.
  - (b) Requiring the submission and implementation of plans to improve Services.
  - (c) Requiring the payment of credits or rebates to Customers.
  - (d) Imposing any penalties identified in the Broadcasting and Telecommunication Act, 2000, or the relevant Licence.
- (3) When applying sanctions if a Participating Provider commits a contravention the Minister may take into account the following factors:
  - (a) The extent to which the sanctions can be expected to improve the choice, price or quality of Services.
  - (b) The numbers and natures of the Services, Reporting Periods, Reporting Areas, Indicators and Targets to which the contravention relates.
  - (c) Any effects of the contravention on Customers or other Participating Providers.
  - (d) Any effects of the contravention that are due wholly or partly to other Service Providers.
  - (e) The environmental, financial and operating circumstances of the Participating Provider.
  - (f) The extent of competition with the Participating Provider.
  - (g) Any credits or rebates that have been provided by the Participating Provider to Customers in compensation for the contravention.
  - (h) The extent to which the Participating Provider has complied with these Regulations in the past.
  - (i) Whether the Participating Provider has been designated by the Minister as having Significant Market Power in the market for the relevant Services.
  - (j) The numbers and natures of the sanctions that the Minister applied on earlier occasions when there were contraventions.
- (4) The Minister will not apply sanctions to a Participating Provider for committing a contravention in the following circumstances:
  - (a) The contravention is due to events that the Participating Provider could not control and could not have reasonably foreseen.
  - (b) The contravention is a failure to reach Targets but the Participating Provider has not been designated by the Minister as having Significant Market Power in the market for the relevant Services.

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## Indicators for all Services with Fixed Access

Indicator	Target	Measurement Result	Measurement Method
Service supply time	<5 working days for residential Services and <3 working days for business Services	The mean time in working days taken to fulfil relevant service orders	<p>This is related closely to ETSI EG 202 057-1§5.1. It is applicable to Fixed Access. For residential Services and business Services separately, the following Measurement Domains are singled out:</p> <ul style="list-style-type: none"> <li>• Telephony.</li> <li>• Broadband Internet.</li> <li>• Subscription Television.</li> </ul> <p>A service order may be submitted in writing, by phone or at a customer service centre. It is relevant unless at least one of the following holds:</p> <ul style="list-style-type: none"> <li>• It is solely about Services that the Service Provider does not supply within two hundred (200) metres of the premises of the Customer (in which case it is a service complaint).</li> <li>• It is solely about Services that have been ordered already (in which case it is a service complaint).</li> </ul> <p>The time taken to fulfil a relevant service order is measured from when the service order is accepted by the Service Provider to when the Service is available in normal working order for use by the Customer.</p> <p>The service orders contributing to the Measurement Result are those relevant ones that according to System Readings are fulfilled in the Reporting Area during the Reporting Period.</p> <p>The Measurement Result is the sum of the times taken to fulfil such service orders divided by the number of relevant service orders. It, and the number of relevant service orders, are reported separately for each Measurement Domain in each Reporting Area.</p> <p>Service orders that are to be fulfilled at multiple times or places are counted as multiple service orders.</p>

Indicator	Target	Measurement Result	Measurement Method
Fault report ratio	<9% per quarter	The percentage of relevant fault reports submitted per Customer	<p>This is related closely to ETSI EG 202 057-1§5.4. It is applicable to Fixed Access. For residential Services and business Services separately, the following Measurement Domains are singled out:</p> <ul style="list-style-type: none"> <li>• Telephony.</li> <li>• Broadband Internet.</li> <li>• Subscription Television.</li> </ul> <p>A fault report may be submitted in writing, by phone or at a customer service centre. It is relevant unless at least one of the following holds:</p> <ul style="list-style-type: none"> <li>• It is solely about deficiencies that are not associated by the Customer with particular network locations (in which case it is a service complaint).</li> <li>• It is solely about faults that have been reported already by the same Customer (in which case it is a service complaint).</li> <li>• It is solely about faults that are not found when tested.</li> <li>• It is solely about equipment that is not supplied, connected or maintained by the Service Provider.</li> <li>• It is solely about faults that have arisen during, and because of, maintenance operations about which notice has been given through the press and broadcasters at least forty-eight (48) hours in advance</li> <li>• It is solely about faults that have arisen because of a duly declared state of emergency.</li> </ul> <p>The fault reports contributing to the Measurement Result are those relevant ones that according to System Readings are submitted in the Reporting Area during the Reporting Period.</p> <p>The Measurement Result is the number of such fault reports divided by the number of Customers for Services in the Measurement Domain in the Reporting Area at the end of the Reporting Period. It, and the number of Customers for Services in the Measurement Domain in the Reporting Area at the end of the Reporting Period, are reported separately for each Measurement Domain in each Reporting Area.</p> <p>Fault reports about multiple paths are counted as multiple fault reports.</p>

Indicator	Target	Measurement Result	Measurement Method
Fault repair time	<72 hours for residential Services and <4 hours for business Services	The mean time in hours taken to clear relevant fault reports	<p>This is related closely to ETSI EG 202 057-1§5.5. It is applicable to Fixed Access. For residential Services and business Services separately, the following Measurement Domains are singled out:</p> <ul style="list-style-type: none"> <li>• Telephony.</li> <li>• Broadband Internet.</li> <li>• Subscription Television.</li> </ul> <p>A fault report may be submitted in writing, by phone or at a customer service centre. It is relevant unless at least one of the following holds:</p> <ul style="list-style-type: none"> <li>• It is really a service order.</li> <li>• It is really a service complaint.</li> <li>• It is solely about faults that have been reported already by the same Customer.</li> <li>• It is solely about faults that are not found when tested.</li> <li>• It is solely about equipment that is not supplied, connected or maintained by the Service Provider.</li> <li>• It is solely about faults that have arisen during, and directly because of, maintenance operations about which notice has been given through the press and broadcasters at least forty-eight (48) hours in advance.</li> <li>• It is solely about faults that have arisen because of a duly declared state of emergency.</li> </ul> <p>The time taken to clear a relevant fault report is measured from when the fault report is received by a Service Provider to when the Service is restored to normal working order for use by the Customer.</p> <p>The fault reports contributing to the Measurement Result are those relevant ones that according to System Readings are cleared in the Reporting Area during the Reporting Period.</p> <p>The Measurement Result is the sum of the times taken to clear such fault reports divided by the number of relevant fault reports. It, and the number of relevant fault reports, are reported separately for each Measurement Domain in each Reporting Area.</p> <p>Fault reports about multiple paths are counted as multiple fault reports.</p>

## Indicators for all Services with Mobile Access

Community isolation		The percentage of the Reporting Period in which traffic is affected by unplanned outages in one or more localities for one or more hours	<p>This is applicable to Mobile Access. For each Access Technology there is one Measurement Domain, comprising the Services supported by that Access Technology.</p> <p>An outage is unplanned if it occurs except during, and directly because of, maintenance operations about which notice has been given through the press and broadcasters at least forty-eight (48) hours in advance.</p> <p>The outages contributing to the Measurement Result are the unplanned ones that according to System Readings could affect traffic to or from at least four hundred (400) Customers or one (1) base station (whichever is worse) in the Reporting Area for at least one (1) continuous hour during the Reporting Period.</p> <p>The Measurement Result is the sum of the times taken by such outages during the Reporting Period divided by the length of the Reporting Period (and truncated to be at most that length). It, and the number of such outages, are reported separately for each Measurement Domain in each Reporting Area.</p> <p>Outages that take overlapping times but affect traffic to or from different groups of Customers or base stations are counted as separate outages, with separate times taken.</p>
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Coverage		<p>The percentage of points where the received signal is strong enough to provide moderately good support to voice calls and data transfers</p>	<p>This is applicable to Mobile Access. For each Access Technology there is one Measurement Domain, comprising the Services supported by that Access Technology.</p> <p>The Minister may change the definition of ‘strong enough’. Unless the Minister does this, a received signal is strong enough at a point where a Measurement of the received signal is made if at least one of the following holds:</p> <ul style="list-style-type: none"> <li>• The Access Technology is GSM (with its variants GPRS and EDGE) and (a) RSSI&gt;-85 dBm or (b) RSSI&gt;-95 dBm and the point is indoors or (c) RSSI&gt;-95 dBm and the point is moving with a speed of at least 10 km/hour.</li> <li>• The Access Technology is UMTS (with its variants WCDMA and HSPA) and (a) RSCP&gt;-85 dBm or (b) RSCP&gt;-95 dBm and the point is indoors or (c) RSCP&gt;-95 dBm and the point is moving with a speed of at least 10 km/hour.</li> <li>• The Access Technology is LTE (with its variants LTE-A and LTE-U) and (a) RSRP&gt;-95 dBm or (b) RSRP&gt;-105 dBm and the point is indoors or (c) RSRP&gt;-105 dBm and the point is moving with a speed of at least 10 km/hour.</li> </ul> <p>The points contributing to the Measurement Result are all of those where according to Field Tests in the Reporting Area during the Reporting Period the received signal is strong enough.</p> <p>The Measurement Result is the number of such points divided by the number of points where Measurements of the received signal are made. It, and the times and places of the Measurements, are reported separately for each Measurement Domain in each Reporting Area.</p>
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## Indicators for Telephony with Mobile Access

Unsuccessful call setup ratio	<2%	The percentage of attempted calls not set up successfully	<p>This is related closely to ETSI EG 202 057-3§6.4.1. It is applicable to Mobile Access. For it there is one Measurement Domain, comprising the Telephony Services.</p> <p>A call setup is unsuccessful if, though a valid number is properly dialled following dial tone, the calling user does not receive the called user busy tone, ringing tone or answer signal. The calls counted for this purpose are all of those to destinations in the country, regardless of the networks that host the destinations.</p> <p>The unsuccessful call setups contributing to the Measurement Result are those call setups in the Reporting Area that according to System Readings are unsuccessful during the Reporting Period.</p> <p>The Measurement Result is the number of such unsuccessful call setups divided by the number of attempted call setups in the Reporting Area during the Reporting Period. It, and the number of attempted call setups, are reported separately for each Measurement Domain in each Reporting Area.</p>
Dropped call ratio	<2%	The percentage of successfully setup calls not continued until ended by a user	<p>This is related closely to ETSI EG 202 057-3§6.4.2. It is applicable to Mobile Access. For it there is one Measurement Domain, comprising the Telephony Services.</p> <p>A dropped call is a call that after successful setup does not continue until it is ended by a user. The calls counted for this purpose are all of those to destinations in the country, regardless of the networks that host the destinations.</p> <p>The dropped calls contributing to the Measurement Result are those calls with successful setups in the Reporting Area that according to System Readings are dropped during the Reporting Period.</p> <p>The Measurement Result is the number of such dropped calls divided by the number of successful call setups in the Reporting Area during the Reporting Period. It, and the number of successful call setups, are reported separately for each Measurement Domain in each Reporting Area.</p>

## Indicators for Broadband Internet with Fixed Access or Mobile Access

Latency	<200 milliseconds	The mean time in milliseconds taken to complete successful round trip data transfers, for each remote end point	<p>This is related closely to ETSI TS 102 250-2§6.3.1. It is applicable to Fixed Access and Mobile Access separately. For each of them and for each pair of Downlink and Uplink Data Transfer Rates or each Access Technology there is one Measurement Domain, comprising the Broadband Internet Services advertised with that pair of Data Transfer Rates or that Access Technology.</p> <p>Separate Measurement Results are provided for two remote end points (one in Europe and one in Asia); the choice of remote end points needs to be approved by the Minister.</p> <p>The successful data transfers contributing to the Measurement Result (for a given remote end point) are those data transfers that according to Field Tests in the Reporting Area during the Reporting Period are completed without error in a certain time period. The Minister may change the time period, the protocol for the data transfer and the payload size for the data packets. Unless the Minister does this, the time period is 2 seconds for a round trip, the protocol is ICMP and the payload size is 32 bytes.</p> <p>The Measurement Result is the sum of the times taken to complete such successful transfers divided by the number of such transfers. It, and the times and places of the Measurements, are reported separately for each remote end point for each Measurement Domain in each Reporting Area.</p>
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Packet loss ratio	<1%	The percentage of round trip data transfers not completed successfully, for each remote end point	<p>This is applicable to Fixed Access and Mobile Access separately. For each of them and for each pair of Downlink and Uplink Data Transfer Rates or each Access Technology there is one Measurement Domain, comprising the Broadband Internet Services advertised with that pair of Data Transfer Rates or that Access Technology.</p> <p>Separate Measurement Results are provided for two remote end points (one in Europe and one in Asia); the choice of remote end points needs to be approved by the Minister.</p> <p>The unsuccessful data transfers contributing to the Measurement Result (for a given remote end point) are those data transfers that according to System Readings in the Reporting Area during the Reporting Period are not completed without error in a certain time period. The Minister may change the time period, the protocol for the data transfer and the payload size for the data packets. Unless the Minister does this, the time period is 2 seconds for a round trip, the protocol is ICMP and the payload size is 32 bytes.</p> <p>The Measurement Result is the number of such unsuccessful data transfers divided by the number of attempted data transfers. It, and the times and places of the Measurements, are reported separately for each remote end point for each Measurement Domain in each Reporting Area.</p>
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Throughput		The mean Downlink and Uplink Data Transfer Rates in megabits per second, for each remote end point	<p>This is related distantly to ETSI TS 102 250-2§6.8.7. It is applicable to Fixed Access and Mobile Access separately. For each of them and for each pair of Downlink and Uplink Data Transfer Rates or each Access Technology there is one Measurement Domain, comprising the Broadband Internet Services advertised with that pair of Data Transfer Rates or that Access Technology.</p> <p>Separate Measurement Results are provided for two remote end points (one in Europe and one in Asia); the choice of remote end points needs to be approved by the Minister.</p> <p>The successful file downloads or uploads contributing to the Measurement Result (for a given remote end point) are those downloads or uploads that according to Field Tests in the Reporting Area during the Reporting Period are completed without error in a certain time period. The Minister may change the time period, the protocol for the file downloads or uploads and the file size. Unless the Minister does this, the time period is 120 seconds, the protocol is HTTP over single TCP connections and the file size is 512,000 bytes. The files are downloaded to measure the Downlink Data Transfer Rate and are uploaded to measure the Uplink Data Transfer Rate. The time taken by an attempted file download or upload that is not successful is regarded as being the given time period.</p> <p>The Measurement Result is the sum of the sizes of the files downloaded or uploaded in such successful downloads or uploads divided by the sum of the times taken by attempted downloads or uploads. It, and the sum of the times taken by attempted downloads or uploads, are reported separately for the Downlink and Uplink for each remote end point for each Measurement Domain in each Reporting Area.</p>
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## Indicators for all Services with Fixed Access or Mobile Access

Service complaint ratio	<3% per quarter	The percentage of relevant service complaints submitted per Customer, for each topic of service complaints	<p>This is related closely to ETSI EG 202 057-1§5.9, ETSI EG 202 057-1§5.11 and ETSI EG 202 057-1§5.12. It is applicable to Fixed Access and Mobile Access separately. For each of them and for residential Services and business Services separately, the following Measurement Domains are singled out:</p> <ul style="list-style-type: none"> <li>• Telephony.</li> <li>• Broadband Internet.</li> <li>• Subscription Television.</li> </ul> <p>For each of these the following topics of service complaints are distinguished from each other:</p> <ul style="list-style-type: none"> <li>• Billing, charging, payments and credit management.</li> <li>• Network operation, coverage, availability and performance.</li> <li>• Customer service, complaint handling and request fulfilment.</li> <li>• Other.</li> </ul> <p>A service complaint may be submitted in writing, by phone or at a customer service centre. It is relevant unless at least one of the following holds:</p> <ul style="list-style-type: none"> <li>• It is a relevant service order.</li> <li>• It is a relevant fault report.</li> <li>• It is solely a request for information.</li> <li>• It is solely a request to add, change or end Services.</li> <li>• It is solely about Services of other Service Providers.</li> </ul> <p>The service complaints contributing to the Measurement Result for a given topic are the relevant ones that according to System Readings are submitted in the Reporting Area during the Reporting Period.</p> <p>The Measurement Result is the number of such service complaints divided by the number of Customers for Services in the Measurement Domain in the Reporting Area at the end of the Reporting Period. It, and the number of Customers, are reported separately for each topic for each Measurement Domain in each Reporting Area.</p> <p>Service complaints about multiple topics are counted as multiple service complaints.</p>
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Service complaint resolution time	<48 hours	The mean time in hours taken to resolve relevant service complaints, for each topic of service complaints	<p>This is related closely to ETSI EG 202 057-1§5.10. It is applicable to Fixed Access and Mobile Access separately. For each of them and for residential Services and business Services separately, the following Measurement Domains are singled out:</p> <ul style="list-style-type: none"> <li>• Telephony.</li> <li>• Broadband Internet.</li> <li>• Subscription Television.</li> </ul> <p>For each of these the following topics of service complaints are distinguished from each other:</p> <ul style="list-style-type: none"> <li>• Billing, charging, payments and credit management.</li> <li>• Network operation, coverage, availability and performance.</li> <li>• Customer service, complaint handling and request fulfilment.</li> <li>• Other.</li> </ul> <p>A service complaint may be submitted in writing, by phone or at a customer service centre. It is relevant unless at least one of the following holds:</p> <ul style="list-style-type: none"> <li>• It is a relevant service order.</li> <li>• It is a relevant fault report.</li> <li>• It is solely a request for information.</li> <li>• It is solely a request to add, change or end Services.</li> <li>• It is solely about Services of other Service Providers.</li> </ul> <p>The time taken to resolve a relevant service complaint is measured from when the service complaint is received by a Service Provider to when the Customer is satisfied with the outcome.</p> <p>The service complaints contributing to the Measurement Result for a given topic are the relevant ones that according to System Readings are resolved in the Reporting Area during the Reporting Period.</p> <p>The Measurement Result is the sum of the times taken to resolve such service complaints divided by the number of relevant service complaints. It, and the number of relevant service complaints, are reported separately for each topic for each Measurement Domain in each Reporting Area.</p> <p>Service complaints about multiple topics are counted as multiple service complaints.</p>
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Customer call answer time	<30 seconds	The mean time in seconds taken to answer customer calls	<p>This is related closely to ETSI EG 202 057-1§5.6, ETSI EG 202 057-1§5.7 and ETSI EG 202 057-1§5.8. It is applicable to Fixed Access and Mobile Access, which together form its one Measurement Domain.</p> <p>Different telephone numbers for customer calls are distinguished from each other. The customer calls might be for any purposes, including operator assistance and directory enquiries.</p> <p>The time taken to answer a customer call is measured from when the calling user receives the called user busy tone, ringing tone or answer signal to when a human answers.</p> <p>A customer call is relevant if it is made to a telephone number that can provide a human answer, possibly after voice or keypad interactions.</p> <p>The customer calls contributing to the Measurement Result (for a given telephone number) are the relevant ones that according to System Readings are made from the Reporting Area during the Reporting Period.</p> <p>The Measurement Result is the sum of the times taken to answer such customer calls divided by the number of relevant customer calls. It, and the number of relevant customer calls, are reported separately for each telephone number for each Reporting Area.</p>
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