REVIEW OF QUALITY OF SERVICE FRAMEWORK
FOR BROADBAND ACCESS SERVICES

OBJECTIVE

1.   The objective of this consultation paper is to seek the comments of the industry and public on the proposed quality of service (QoS) parameters for broadband access services in Singapore.

BACKGROUND

2.   In general, the Internet is a network of inter-connected networks that comprises of various technologies, sizes, capabilities and ownership. As such, unless the end-to-end infrastructure is owned by one single entity, it will be difficult to guarantee end-to-end performance on a global scale. The Internet is therefore referred to as a delivery platform that is based on a best effort mechanism.

3.   An end user's experience is dictated by the entire end-to-end connection between the end user and the destination site accessed. Hence any segments within this connection would be a possible cause if 'slow' speeds were experienced. In other words, apart from the international bandwidth provisioned by an Internet network service provider, there are many contributory factors that must be appreciated (refer to Annex 1 for the details).

CURRENT REGULATORY REQUIREMENTS

4.   Since October 1999, IDA has put in place a set of minimum QoS standards for broadband access service providers to comply with. These are monthly indicators which include standards for network quality such as network availability and accessibility (be it via ADSL or cable modem), as well as service activation time (see Annex 2).

5.   IDA monitors the performance of these operators by requiring them to submit quarterly reports on the indicators set. Non-compliance with the primary parameters will render the operators liable to a fine of $5,000. Thus far, SingTel Magix and Singapore Cable Vision (SCV) have been complying with the QoS standards set. Nonetheless, it has been noted from recent public complaints that consumer expectations have shifted from ease of connectivity

to speed of response time, as more subscribers want fast connections to the Internet.

6. This review of existing QoS standards is undertaken in support of IDA's Infocomm 21 strategies to jumpstart the interactive broadband multimedia (IBBMM) industry, by stimulating demand for and supply of IBBMM content and services. The review will help to raise the overall technical performance and service levels of our broadband access providers.

CONFIGURATION OF BROADBAND NETWORK

7. In order for meaningful broadband access standards to be set, an understanding of how broadband traffic is currently routed for retrieval of content within the S-One network and from the Internet is necessary (see Annex 3 for the diagrammatic representation). As the transmission of broadband traffic involves the handing over of data packets over different operators' network (also known as hops), broadband access service providers (currently SingTel Magix and SCV) would need to set up Service Level Agreements (SLAs) with appropriate parties to ensure minimum service level delivery[1].

8. On the whole, local service providers can only control the QoS for retrieval of information from sites hosted locally. For transmission of Internet traffic, network qualities such as routing delays at the overseas end, beyond the first overseas point of presence (usually at the US), are generally beyond the control of local service providers because the traffic is again being routed over several hops, and local service providers have no control over such routing arrangements. The routing arrangements could also affect end-user experience, in addition to the factors explained in Annex 1.

REVIEW OF QOS FRAMEWORK

9. Several ping (trace-route) tests have shown that the QoS for broadband access, including content download speed, within the S-One network is good and fast. The problem of slow access occurs when users try to access content sites residing outside Singapore via the Internet. To improve user experience, 2 new

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[1] Currently, SLAs for network availability and network reliability have been signed between the various parties to guarantee specific service quality levels at a certain price. However, it is not common for SLAs to be set up for minimum network latency (or delay) as it is difficult to guarantee due to the routing dynamism.

QoS indicators, namely **Network Latency**[2] and **Bandwidth Utilisation** could be included.

10. Upon preliminary technical study and discussion with the broadband access operators, the following QoS benchmarks are proposed.

(a) Network Latency

Broadband Access Service Providers	Proposed Minimum QoS Standards (Monthly Indicators)	Remarks
SCV, SingTel Magix and other broadband access providers	The round trip delay for traffic within the **local** broadband network from end-user to IX should be less than 85 msec for 95% of the time during peak hours	The QoS latency figure extends from the broadband user to all connections within the local networks (ie. 1-Net, IASPs, IX etc.). It does not, however, include the latency of sites hosted via corporate lease lines nor the web-server performance of different company web-pages as these are factors determined by the company owning the sites and not the service provider.
	The round trip delay for traffic in **international portion** of the broadband network from IX to the first point of presence (POP) in U.S. should be less than 300 msec for 95% of the time during peak hours	The international portion of the broadband network extends from beyond the domestic broadband local network up to the network provider's point-of-presence (POP) in the U.S, or the first point of entry in the US.

(b) Bandwidth Utilisation

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[2] Network latency or delay is the time taken for a data packet to get from one designated point to another.

The bandwidth utilisation of all network links shown in Annex 3 must ideally be less than 75% loading for 95% of the time during peak hours (on a monthly basis).

11.   The broadband access service providers are solely responsible for the network service quality and performance. It will be for the broadband access providers to negotiate commercially with their respective upstream network providers (ie. the IASPs and IXSPs) on the SLAs that the latter must deliver, so as to meet IDA's QoS requirements. Broadband access service providers are ultimately accountable to their customers for their quality of service and it is in their interest to factor in the SLA from their upstream network providers in the delivery of service to customers.

12.   The Network Latency indicator will be treated as a <u>Primary</u> indicator due to the importance of access speed over a broadband network. A fine of $5,000 would be imposed on the broadband access service providers should there be any failure by them to comply with the standards.

13.   As for the Bandwidth Utilisation parameter, the ISPs/IXSPs have to alert their connected broadband access service providers when the bandwidth utilisation of the terrestrial link reaches 75%. Should the bandwidth utilisation exceed the 90% loading level, IDA will require the broadband access service provider to immediately purchase additional bandwidth, unless it is able to justify to IDA's satisfaction that the existing arrangement is the best under the current constraints and limitations.

IMPLEMENTATION

14.   As a start, the broadband access service providers and IXSPs will be required to submit these 2 additional QoS statistics to IDA on a monthly basis. Once the situation stabilises, IDA will revert to the quarterly reporting structure.

15.   In terms of field monitoring, IDA will require the broadband access service providers to consolidate the Multi-Router Traffic Grapher (MRTG) charts for the various transmission points within the broadband network and submit them to IDA for verification of the accuracy and consistency of the QoS performance reported. As a further check, IDA would also require the broadband access provider to submit information on the ratio of bandwidth to users. This ratio

would serve as an additional guide to indicate whether the bandwidth purchased by the broadband access service providers is overloaded.

16. Since this is the first attempt by IDA to set QoS for broadband access speeds (no other regulator in the world has implemented this to the best of our knowledge), empirical data is needed to determine whether the set parameters are sufficiently stringent to meet the users' requirements. IDA would therefore provide for a "trial" period of 3 months, beginning 1 July 2000, to study the information collated by the broadband access service providers.

17. In the long run, operators should have more accountability to their own customers and IDA would facilitate this by requiring the broadband access service providers to publish their QoS performance so that consumers can make informed choices when deciding on service providers.

REQUEST FOR COMMENTS

18. IDA invites broadband access service providers, users and other interested parties to submit written comments with regard to the proposed new QoS standards.

19. IDA requests that the following outline be used in providing the comments:

   ♦ General views and comments on the overall approach of the current and revised QoS frameworks (which includes the additional parameters outlined in para 10);
   ♦ Comments regarding specific aspects of the QoS indicators; and
   ♦ Suggestions for removal/additional parameters.

20. All comments should be submitted to IDA in hard copy (1 copy) and diskette (Word 97 format). Comments may also be e-mailed. Comments should be clear and succinct. All written comments should be submitted to **IDA by 12 noon on 31 August 2000**. Comments received after 12 noon will not be accepted or considered. Respondents are required to include their personal/company particulars as well as correspondence address in their submissions. All comments should be addressed to:

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21.   IDA will post all comments received on its website.

22.   Based on the written comments, IDA will make the appropriate modifications to the proposed QoS framework. IDA plans to implement the revised QoS framework by the fourth quarter of 2000.

Info-communications Development Authority of Singapore
22 June 2000