

**Interconnection/Access In A Fully Liberalized And Convergent
Environment**

**A CONSULTATION DOCUMENT
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**REPUBLIC OF SINGAPORE
INFOCOMM DEVELOPMENT AUTHORITY
OF SINGAPORE**

TABLE OF CONTENTS

<u>1.</u>	<u>INTRODUCTION</u>	3
<u>2.</u>	<u>APPROACH TO INTERCONNECTION</u>	4
<u>3.</u>	<u>SCOPE OF INTERCONNECTION PRINCIPLES</u>	9
<u>4.</u>	<u>OBLIGATIONS OF OPERATORS</u>	10
<u>5.</u>	<u>CHARGING STANDARDS</u>	12
5.1.	<u>COST BASES</u>	12
5.2.	<u>COST STANDARDS</u>	14
<u>6.</u>	<u>RESPONSIBILITY FOR CHARGES</u>	15
6.1.	<u>PHYSICAL INTERCONNECTION (PI), UNBUNDLED NETWORK ELEMENTS (UNES), AND ESSENTIAL SUPPORT FACILITIES (ESFs)</u>	15
6.2.	<u>ORIGINATING/TERMINATING (O/T) SERVICES</u>	16
<u>7.</u>	<u>STRUCTURE OF CHARGES</u>	18
7.1.	<u>SYMMETRY OF CHARGES</u>	18
7.2.	<u>ADDITIONAL CONSIDERATIONS FOR BROADBAND</u>	21
<u>8.</u>	<u>REQUEST FOR COMMENTS</u>	23
<u>9.</u>	<u>APPENDIX</u>	25

1. INTRODUCTION

- 1.1. With the move towards full liberalization of the telecommunications industry, the Infocomm Development Authority of Singapore (IDA) welcomes the entry of new players and the expansion of existing players' into an increasingly convergent market. In fostering the new info-communications market place, the IDA would like to collaborate with players to ensure the development of a competitive market place and in particular, to rollout broadband infrastructure and to increase the penetration of broadband services.

- 1.2. The IDA recognizes that its current interconnection and access regulatory regime is more relevant for traditional telephony-based operators, representing a sub-set of the types of operators licensed by the IDA. The IDA seeks comments on the appropriate interconnection policy direction and regulatory framework that will be incorporated in the Code of Practice for Competition in the Provision of Telecommunication Services ("Code"). This document is intended to be read together with the consultation document on "Code of Practice for Competition in the Provision of Telecommunication Services". This document outlines the current thinking of the IDA with respect to the regulation of interconnection, including broadband interconnection. The IDA would like to receive written comments on the proposed interconnection approach and framework outlined in this document, and will take them into consideration before release of the Code.

- 1.3. In reviewing the interconnection and access policy direction and regulatory regime, the IDA is guided by the following policy goals:
 - 1.3.1. *Develop the ICT sector as a major sector of growth by positioning Singapore as a vital node (includes technology platforms, knowledge capital, and transparent pro-business pro-consumer regulations) in the regional and global information networks of the future;*
 - 1.3.2. *Prepare Singapore for the information society of the future by enhancing the quality of life, ensuring all sectors of consumers enjoy*

the benefits of ICT, and reducing the risk of a “digital divide” in Singapore society; and

1.3.3. Encourage companies in all other economic sectors to leverage on ICT as a competitive tool.

1.4. To support these goals for Singapore, the IDA’s policy objectives with respect to interconnection and access are as follows:

1.4.1. Actively encourage infrastructure investment, in particular, new and ubiquitous broadband infrastructure investment; and international connectivity and capacity;

1.4.2. Actively promote the development and use of innovative services, including interactive multi-media broadband services; and

1.4.3. Irrespective of the network to which a customer is connected, ensure seamless, any-to-any, system and service connectivity.

The IDA believes that the interconnection and access framework outlined below meet these policy objectives. The IDA seeks comments on its proposed interconnection approach and framework to ensure that all perspectives are fully considered.

2. APPROACH TO INTERCONNECTION

2.1. The policy objectives require meaningful competition in both intra-network infrastructure, i.e. same types of networks or technologies, and inter-network infrastructure i.e. different types of networks or technologies. Intra-network competition has been achieved to an extent through the entry of new mobile and fixed network operators. The IDA is considering ways and means to stimulate inter-network competition, especially where bottlenecks exist in broadband access in certain geographical areas. In the area of broadband access, most areas in Singapore have the option of ADSL or cable modem for broadband access; including fibre for the Central Business District. With limited ADSL and cable modem take-up, and with 3G not operational in the short term, the IDA would like to stimulate competition in the provision of broadband local access and interactive multimedia broadband services.

Question 1: The IDA seeks comments on the appropriate regulatory framework to stimulate competition in the provision of broadband local access and interactive broadband multimedia services, including interconnection with and access to the broadband infrastructure and services in Singapore, and how this would benefit the deployment of broadband local access and services, and whether inter-network competition is likely to develop without such regulation.

2.2. To cope with the ongoing changes in market and technological developments, especially in the broadband environment, the IDA expects to regularly review the Code and will forebear from regulating interconnection if it believes that all consumers and operators will be better served without such regulation. The IDA would periodically review the Code, taking into account changes in technologies and the level of competition in the market place, to refine and improve on the interconnection and access regulatory regime.

2.3. The IDA will mandate access to the ADSL local loop and other broadband networks such as Hybrid Fibre Coaxial (HFC) for cable modem access. Access to submarine cable networks will also be required using digital cross connects that share capacity between operators where the IDA assesses that this is necessary to ensure the development of a competitive market place. The IDA believes that in the short-term, policy interests will be best served if operators can efficiently share transmission capacity and network components, including those for broadband services. In addition to easing the entry of new operators, this will also promote any-to-any system and service connectivity and access for consumers. The method of sharing capacity and the actual interconnection charges will be left to commercial arrangements between operators. However, the IDA is committed to:

2.3.1. Developing interconnection principles with respect to infrastructure, including broadband infrastructure, that focus on ensuring any-to-any connectivity between operators;

2.3.2. Specifying ceilings and floors for inter-network and intra-network interconnection to ensure fair competition, while, delegating the exact level of charges to commercial negotiations; and

2.3.3. Reviewing periodically the Code to ensure its continued relevance and validity in the face of the changes in networking technologies, the extent of infrastructure deployment and the types of operators participating in the marketplace.

Question 2: The IDA seeks comments on its requirement of access to all broadband networks; specifying only ceilings and floors as guidelines for interconnection charges; and revising the Code to reflect market, industry and technology changes on a periodic basis.

2.4. The interconnection obligations of operators with different market power, and between infrastructure and service providers may be revised in the new Code. The IDA understands the argument against removing reciprocal access and the consequent ability of new operators to “cherry-pick” an incumbent’s customers. It has been suggested that “cherry-picking” occurred in the U.S. with the CLEC’s capturing a significant portion of the LEC’s Small and Medium Enterprise (SME) customer base. The IDA will ensure that incumbents are fairly compensated for providing access, including a fair return for the commercial risk undertaken by deploying new and advanced technology. Thereafter, any competitive advantage created by new entrants is seen as a result of service innovations and efficiency in retail, regardless of reciprocity in interconnection regulation.

Question 3: The IDA seeks comments on the need for reciprocity in interconnection arrangement between infrastructure providers, and between infrastructure providers and service providers; and whether non-reciprocity arrangements are more appropriate and under what circumstances .

2.5. The IDA believes that while symmetric charges may be appropriate in the traditional telephony-based context, asymmetrical charges should be permitted in the broadband context to provide incentives for inter-network interconnection. There are significant cost differences between different network technologies, requiring asymmetrical interconnection charges to properly reflect the

underlying cost behavior. The risk exists that interconnecting operators may have employed untried and inefficient technologies, and that the cost based charges may not reflect efficient network design and best utilization of scarce resources. Despite these risks, the realities of differences in cost structures prompt the IDA to permit the use of asymmetrical charges, thereby ensuring that all types of infrastructure operators are adequately compensated for providing interconnection.

Question 4: The IDA seeks comments on the implementation of asymmetrical charges based on the cost structures of the different technologies in use in the broadband interconnection arrangements and if there are other arrangements that may be more appropriate and if so, under what circumstances.

2.6. The IDA is considering revisions that allow differential charges for different classes of operators. This may not be consistent with the principle of cost orientation, as the cost of providing interconnection related services is the same whether the interconnecting party is a value added service provider or another facilities based operator. Notwithstanding that service-based operators play a critical role in improving the level of innovative services, packaging and customer care, providing incentives for infrastructure players, especially broadband infrastructure players, to continue to upgrade and invest in new technology platforms and networks is crucial to ensuring that the IDA meets its policy objectives. The IDA is therefore considering differential charges to ensure the right balance of incentives between infrastructure investment and service innovations.

Question 5: The IDA seeks comments on the implementation of differential interconnection charges – one set that is applicable between different infrastructure providers, and another that is applicable between infrastructure providers and service providers and if there are other arrangements that may be more appropriate and if so, under what circumstances.

2.7. Specifically, to promote the objective of ubiquitous broadband infrastructure deployment, the IDA is inclined to compensate operators for the additional risks taken in providing broadband services by permitting a premium to be included in the cost of capital. For lower risk investments, a standard rate of return on capital would be appropriate. Broadband is currently a high-risk investment, and the IDA is considering revisions to allow a cost of capital that is commensurate with the risks taken.

Question 6: The IDA seeks comments on the inclusion of a risk premium in the cost of capital for broadband infrastructure and service deployment.

2.8. The IDA wishes to give operators maximum flexibility in their network and technology decisions and will continue to adopt a technology neutral approach towards interconnection, the platforms adopted, and the configurations deployed. The revisions for interconnection, including broadband interconnection, are focused on meeting the policy objectives with respect to the five key dimensions of the interconnection framework:

- 2.8.1. *Scope of Interconnection Services*, specifying the classes of operators and the interconnection related services (IRSs) that should be provided by one operator to another;
- 2.8.2. *Obligation to Provide Interconnection Services*, specifying the principles which govern the actions of operators in providing IRSs and the conditions under which these arise;
- 2.8.3. *Responsibility for Charges*, prescribing which operator should pay or receive payment for IRSs;
- 2.8.4. *Cost Standards*, setting out the rules to determine which cost items should be included in the determination of interconnection charges and the costing methodology for ascertaining the level of these charges; and
- 2.8.5. *Structure of Charges* describing the principles governing how charges should be configured to properly reflect the underlying cost behavior.

3. SCOPE OF INTERCONNECTION PRINCIPLES

3.1 Currently, the IDA has set four major classes of IRS for traditional telephony-based context, *i.e. physical interconnect (PI); origination and termination (O/T); unbundled network elements (UNEs); and essential support facilities (ESFs).*¹ These four major classes of IRS will remain under consideration for interconnection charging purposes. All types of info-communications services, voice, video, text, and multi-media; and all types of traffic, one-way, two-way, point-to-point and point to multi-point will be considered to be within the jurisdiction of the proposed COP.

3.2 The IDA is considering the following changes to the four IRSs to be relevant in the broadband context

Table 1: Changes to the IRS Considering the Broadband Context

PI and UNE	<ol style="list-style-type: none"> 1. Expanding the list of physical POIs and UNEs to accommodate all types of inter and intra networks POIs 2. In contrast to the traditional telephony-based narrowband context, broadband interconnection permits many operators to share the available capacity at POIs.
O/T	<ol style="list-style-type: none"> 3. One-way and point-to-multipoint considerations will need to be included in the treatment of O/T services
ESF	<ul style="list-style-type: none"> • No change

3.3. In a broadband environment, POIs and UNEs can be either dedicated, i.e. 100% of the available capacity is provided by one operator to another, or shared, i.e. a lesser proportion of the available capacity is provided by one operator to another. Capacity is dedicated when physical elements of an operator's network are used on an exclusive basis for an agreed upon time by the requesting operator. For example, a requesting operator can lease the entire copper loop between an ADSL transmission unit in the central office and the customer premise. Alternatively, a requesting operator can lease only a portion of the capacity in the ADSL loop on the basis of frequency. The

¹ In general:

- PI is the linking of two networks to enable exchange of traffic and gain access to UNEs.
- O/T services are distinguished by the destination of a transmission. Origination services arise when a service is being accessed whereas termination services arise when a transmission is destined for an access customer.
- UNEs are the physical facilities and network equipment which may be required by new operators in the interim period until their own networks are deployed.
- ESFs are facilities provided for use by a requesting operator and for which no viable alternatives exist, and primarily for the purpose of deploying the requesting operator's network equipment.

providing may operator control the 4 kHz of frequency for voice, while the requesting operator may use some of the higher frequencies (up to 2 MHz) for data. The latter example is often referred to as a constant bit rate (CBR) interconnection service. When the CBR uses the entire available capacity at the POI, it is considered a dedicated interconnection service.

- 3.4. While traditional telephony-based interconnection primarily considers two-way communications and point to point, e.g. voice call or smart message service, in the broadband environment, one-way communications and point to multi-point are just as likely, i.e. one customer or content provider broadcasts to many customers, e.g. a television programme. Alternatively, the one-way communication can remain point to point, e.g. turning on a domestic appliance through the Internet.
- 3.5. ESFs are similar to bottlenecks with an added constraint. The constraint is that it is not economically viable to construct or bypass an ESF. Similar considerations exist for ESFs regardless of the narrowband or broadband context and with operators in both environments being required to share ESFs.

Question 7: The IDA seeks comments on the scope of technologies and services to be included in the proposed Code with respect to IRS to ensure that the Code achieves the IDA's policy objective of transparent, any-to-any interconnection, and open access.

4. OBLIGATIONS OF OPERATORS

- 4.1 The IDA intends to take the following policy approach for the Code:

“Carriers² will allow fair and non-discriminatory, direct or indirect access to their systems, to provide interconnection related services and will establish compensation arrangements for the origination, transport and/or termination of all services carried across each other's systems and with systems of value added service providers (VASPs)³. VASPs

² Please refer to Section 9

³ Please refer to Section 9

can choose to require access to any carrier either through establishing direct interconnection with the carrier's systems or indirectly through interconnection with other carrier's systems.

The actual points of interconnection will be determined by negotiations between the requesting and providing operators. However, based on the capacity requirements of the interconnecting operators, the providing operator must ensure that the numbers of points of interconnection are sufficient to guarantee a quality that is consistent with that achieved by the providing operator for their own services. Further, operators are obliged to disclose information on technical standards, changes to networks that affect interconnecting operators, and must consider actively the requirements of interconnecting operators when constructing or acquiring new facilities."

- 4.2. The obligation to provide access supports the policy objectives of any-to-any connectivity for business and residential consumers in Singapore. From a new carrier's viewpoint, if direct access is a deterrent to entry, indirect access is allowed. Indirect access will allow the emergence of carrier's carriers who are efficient at providing transit services and bringing Singapore closer to its objective of becoming a regional info-communications hub.
- 4.3. While VASPs may choose to exercise their right to access, the IDA is inclined to take the view that there should be no reciprocal obligation to provide access. The IDA wishes to attract new and innovative service providers and believes that an obligation to provide access, particularly in the early stages of broadband service development, could impose a significant financial burden on new VASPs.
- 4.4. The IDA is however concerned that allowing indirect access may result in undesirable effects such as an increase in transmission delay, increases in the number of possible points of failure, information degradation in the transmission path due to attenuation, and less ability to manage the exchange of traffic between networks. Stringent direct access requirements, on the

other hand, may make Singapore less attractive to new entrants. The IDA thus wishes to balance its concerns with regard to quality of service achieved against the entry barriers created by obligations to provide direct access.

- 4.5. The IDA notes that Hong Kong's regulator OFTA is considering obliging all classes of operators in the broadband context to provide access. The IDA also notes that UK's regulator, OFTEL, on the other hand, confers rights to local loop access to all classes of operators, without a reciprocal obligation to provide access by certain classes. The IDA further notes that in the US, there is a requirement to provide access to ensure end-to-end communications for all types of operators, however, this is limited to voice communications.

Question 8: The IDA seeks comments on the need for reciprocity in the obligation to provide access between carriers and VASPs. The IDA also seeks comments on whether reciprocity is critical to achieving its objective of transparent, any-to-any interconnection, and open access and if there are other arrangements that may be more appropriate and if so, under what circumstances.

5. CHARGING STANDARDS

5.1 Cost Bases

- 5.1.1 The IDA intends to take the following policy approach for the Code:

Charges shall be based on the forward looking economic cost ("FLEC") standard, i.e., what it would cost the operator to expand its system and operations sufficiently to carry the other operator's interconnecting traffic, using current technology and best practices. However, for the deployment of new infrastructure and broadband services, where it is impractical to use the FLEC cost basis, the current/replacement cost basis will be used. Additionally, the calculation of charges will explicitly recognize a premium in the cost of capital to address the higher risk taken by operators in the deployment of any new broadband infrastructure and broadband services.

- 5.1.2 Three alternative perspectives may be used to determine the costs for an IRS:
- 5.1.2.1 Historical/Embedded costs are the costs that the incumbent operator incurred in the past and that are recorded in the incumbent operator's books of accounts. They reflect historical purchase prices, regulatory depreciation rates, system configurations, and operating procedures.
 - 5.1.2.2 Current/Replacement cost (CRC) is the present-day cost of replacing an asset with another asset that provides the same service potential. The "replacement asset" needs not be the same asset, but rather an asset that hypothetically is the best (least-cost) option given current technology.
 - 5.1.2.3 Forward Looking Economic (FLEC) costs are the prospective costs a firm would incur in producing a service using best-in-use technology and product practices. When calculating forward-looking economic costs, costs are valued at current prices.
- 5.1.3 The IDA is in favor of maintaining the FLEC standard (which is the basis adopted for the traditional telephony-based context) for the following reasons:
- 5.1.3.1 In a competitive environment, market prices would be driven toward FLEC, even if these were lower than the firm's embedded costs.
 - 5.1.3.2 FLEC creates the right investment incentives for facilities based entry by competitors and creates incentives to move towards competition while preserving opportunities for competition even if some network elements prove to be resistant to competition.
 - 5.1.3.3 Charges based on FLEC will lead to lower prices for consumers.
 - 5.1.3.4 FLEC based charging minimizes the incumbent carrier's ability to engage in anti-competitive cross-subsidization.
- 5.1.4 The IDA understands that in a broadband context, FLEC poses certain challenges. There are practicability issues of implementing FLEC, as the operators would be required to design the "best-in-use" network architecture. This could be difficult and time-consuming in the evolving broadband context where standards and technologies for intra-network interconnection may be embryonic. The "best-in-use" technology also evolves rapidly, requiring

updates to the interpretation of FLEC on a regular basis by the IDA and operators. Given the lack of an economic basis for the use of historical costs and the issues in implementing FLEC, the IDA may allow the use of CRC in certain circumstances.

Question 9: The IDA seeks comments on the FLEC cost basis, and the option to use alternative cost standards in the broadband context where appropriate on a case-by-case basis; and if there are other approaches that may be more appropriate and if so, under what circumstances.

5.2 Cost Standards

5.2.1 The IDA intends to take the following policy approach for the Code:

The long run average incremental cost ("LRAIC"), a common measure of FLEC, shall be used in the computation of interconnection charges. LRAIC consists of all variable costs and those fixed costs that are directly attributable to the incremental change in the IRS, as well as the share of indirect costs that are discernibly caused by the provision of those services.

5.2.2 Charges for interconnection should be based on relevant costs. That is, costs incurred as a result of interconnection and the use of IRSs, as well as any costs that could be avoided if such services were not provided. The Code therefore advocates the use of Long Run Average Incremental Costs (LRAIC) for all types of interconnection services. In a broadband environment, the appropriateness of the LRAIC standard holds, and the IDA therefore will still intend to use LRAIC.

Question 10: The IDA seeks comments on the LRAIC cost standard in the broadband context and the earlier discussion inclusion of a premium for risk in the cost of capital and if there are other approaches that may be more appropriate and if so, under what circumstances.

6. RESPONSIBILITY FOR CHARGES

6.1 *Physical Interconnection (PI), Unbundled Network Elements (UNEs), and Essential Support Facilities (ESFs)*

6.1.1 The IDA intends to take the following policy approach for the Code in the area of cost responsibilities for Physical Interconnection (PI), Unbundled Network Elements (UNEs), and Essential Support Facilities (ESFs)

PI, UNE and ESF costs incurred in establishing and maintaining POIs or sharing facilities will be allocated between the interconnecting operators based on relative use (equally for non-traffic sensitive facilities, and an appropriate function of the number of connections, actual usage and capacity requested for traffic sensitive facilities). The IDA is considering the inclusion of a bonus/penalty scheme for efficient/ inefficient utilization of POIs.

6.1.2 Calculating charges based on usage ensures that the charges reflect the actual costs incurred by an individual operator. In the broadband context, the IDA is considering the additional use of capacity based allocations in the calculation of charges. Basing the calculation of charges on capacity used is in line with the cost causality principle in the broadband context. A requesting operator, who uses greater capacity to offer and benefit from the revenues of broadband services, must be responsible for the costs incurred in establishing or maintaining the POIs to support its capacity usage. Additionally, the POIs would no longer need to be dedicated as capacity can be shared across multiple operators. Charges, therefore, should also be shared across the operators. The first carrier or VASP who bears the initial cost of physical interconnection should see its charges decline as more operators use capacity in that POI. To ensure that there are no dis-incentives to becoming the first requesting operator, the first requesting operator should be able to amortize fixed costs, associated with establishing the POI, among all subsequent interconnecting operators.

6.1.3 In the broadband context, costs are affected not only by the number of connections and usage, in terms of minutes or capacity, but also by capacity initially requested. Capacity requirements are typically defined up front in the establishment and maintenance of the POI, and can materially affect the cost of the interconnection when different types of networks are involved. Due to the greater uncertainties in inter-network interconnections, it becomes difficult to ensure from a policy perspective that capacity requirements specified by interconnecting parties are motivated by efficient consumption of interconnection resources given best available information.

6.1.4 The IDA is, therefore, considering establishing a bonus/penalty scheme on interconnection charges based on utilization, i.e. usage as a proportion of capacity requested. The bonus/ penalty scheme will encourage the most efficient usage of the POIs, as it provides incentives for operators to appropriately plan and use the POI based on best available information.

Question 11: The IDA seeks comments on the use of capacity based allocations in broadband context, and the inclusion of bonuses and penalties based on the initial capacity requested for interconnection charges and if there are other approaches that may be more appropriate and if so, under what circumstances.

6.2 Originating/Terminating (O/T) Services

6.2.1 The IDA intends to take the following policy approach for the Code:

Originating charges result from the costs of conveying the traffic generated by the originating carrier's access customer to the terminating carrier's system, enabling its customer to use a service offered by the terminating carrier's system or provided by a value added service provider connected to the terminating carrier's system. Terminating charges result from the costs of conveying the traffic generated by the originating carrier's access customer to the terminating carrier's system, enabling the customer or value added service provider connected to the originating carrier to engage in one-

way/interactive communication with or broadcast content to an access customer of the latter carrier. In the future, the originating carrier, whose customer requests the services being accessed or terminates the communication with an access customer of another carrier, is responsible for all charges as well as the payment of any transit charges to other operators, if applicable.

- 6.2.2 An originating charge could over compensate an operator for providing access in retail tariff regimes that are usage based. The purpose of the originating charge is to compensate the originating carrier when the terminating operator, or the VASP connected to the terminating operator, bills the customer directly and collects all costs incurred in retailing the service. These costs also include the incremental cost of using the originating carrier's network in cases where the customer pays only a flat charge to the originating carrier. The originating charge then compensates the originating carrier for the incremental cost of access to provide the service or the fraction of the cost that is not recovered through usage tariffs. However, as is the case in mobile and fixed line telephony access in Singapore, per minute usage charges exist. A customer requesting a service from a terminating carrier or a VASP, e.g. Operator A's customer requesting stock information from a VASP connected with Operator B's mobile network, not only pays a fixed or usage based fee (number of stock downloads, number of downloads etc.) for the service to the VASP but also pays Operator A for per minute mobile usage. An originating charge then may over compensate Operator A for the incremental costs of accessing the service as Operator A collects additional usage revenue due to the service retailed by Operator B.
- 6.2.3 The IDA understands that any increase in revenue for the originating carrier may not cover the incremental costs of providing access if local usage charges are below the fully compensatory level. If local retail tariffs are not fully compensatory and the current origination charge arrangement is altered, the originating carrier's deficit would increase each time the terminating carrier provides its service. The IDA, therefore, is only considering the above approach for future implementation. Until such time as tariff rebalancing is

effectively completed in Singapore, the terminating operator or the operator whose network provides the service being accessed will be responsible for the originating charges as well as payment of transit charges to other operators, if applicable. Also, the operator originating the transmission that terminates with an access customer of another operator will be responsible for the termination charges, and any transit charges to other operators, if applicable. This is the current situation today, albeit with some modifications for fixed-mobile interconnection given the “mobile party pays” retail charge structure today for mobile communication services.

- 6.2.4 As an alternative the originating carrier can be required to establish calls free of usage charge to the numbers of the terminating carrier’s services or VASP services. The originating carrier will not collect any usage tariffs, and over compensation for the incremental costs of providing access would not be possible if originating charges are cost based. Since there is no usage charge, there is no risk of the originating operator being over compensated by increases in usage revenue. This is feasible in Singapore, as separate numbering schemes exist for end customers and services provided by operators.

Question 12: The IDA seeks comments on the responsibility for origination and termination charges. The IDA also seeks comments on the potential elimination of originating charges, where compensatory usage based retail tariffs are collected by the originating carrier. The IDA is particularly interested to receive comments on whether the current interconnection charges constrain the IDA in achieving the objective of actively promoting broadband service innovations and if there are other approaches that may be more appropriate and if so, under what circumstances.

7. STRUCTURE OF CHARGES

7.1 Symmetry of Charges

- 7.1.1 The IDA intends to take the following policy approach for the Code:

The structure of charges must mirror the cost behavior of IRS provision, where material. This means that costs, which fundamentally behave differently, must remain segregated in the charging structure and must be charged differently

(a) Where the cost of the interconnection is “similar” due to similarities between the interconnecting technologies, the interconnection charges will be symmetrical. Where such costs are different due to differences in technologies, the charges will not be symmetrical.

(b) Differential interconnection charges may be set for different categories of operators, which are authorized to provide info-communications services, where such differences can be justified on the basis of the type of interconnection provided and/or the relevant licensing conditions.

7.1.2 Technological development and convergence enables the provision of equivalent services on different technology platforms, but the cost of providing similar services may be different due to the differences in the cost of the technology employed. Symmetrical interconnection charges are valid only if the interconnecting technologies have similar cost structures. In the broadband context, where there can be differences in cost structure, symmetrical charges can under or over compensate operators.

7.1.3 The variability across broadband networks in providing the same services requires a consideration of the applicability of symmetry of charges in the Code. As necessary, to reflect underlying cost behavior, charges may be asymmetrical if cost differences can be shown to be attributable to differences in underlying network architectures. The application of an asymmetrical charging regime achieves the policy objectives because it:

7.1.3.1 More accurately represents differences in the cost structure of different network architectures;

- 7.1.3.2 Reflects reality in the choice of technology in each network, influenced by licenses held, services provided and planned, network coverage, etc.;
 - 7.1.3.3 Still represents the lowest cost alternative for the “requesting” operator; and,
 - 7.1.3.4 Does not unduly penalize or reward the “providing” and “requesting” operators.
- 7.1.4 To emphasize the objective of encouraging alternative and in particular, new broadband infrastructure, the IDA intends to implement a scheme of differential charges. If new entrants and VASPs have access to existing unbundled network elements at the same charge as carriers then they are indifferent between building and leasing transmission capacity. They are likely to offer services predominantly on the basis of the existing network infrastructure in Singapore. This will not be in line with IDA’s objective of actively deploying alternative broadband infrastructure. Differential charges based on the size of the customer base serviced and the extent of new investments made in Singapore infrastructure are more in line with the current policy objectives. They provide incentives to operators who invest in broadband infrastructure in Singapore and who are willing to provide ubiquitous service.
- 7.1.5 The IDA notes that the UK, US and Canada, since the mid-1990s, have used differentiated interconnection rates to promote inter-network infrastructure competition. Further differentiation of wholesale rates from interconnection charges, ensures that resale competition does not in any way replace the incentives to invest in infrastructure. With infrastructure competition firmly entrenched in the UK, the Department of Trade and Industry is now beginning to accord carrier type status to VASPs, who invest in significant connectable systems, even though they may not have transmission networks.
- 7.1.6 The IDA further notes, “The fundamental bias towards service competition and against infrastructure-based competition will persist, as long as

interconnection conditions are not sufficiently differentiated”.⁴ It has been suggested that failures to differentiate, as in the case of Germany, have considerably penalized infrastructure based competition. Interconnection charges only increased moderately with distance and retail tariffs were not appropriately balanced. This enabled a VASP, MobilCom, to compete and gain share not only against the incumbent Deutsche Telekom but also against new infrastructure investors such as o.tel.o and Arcor. As a result, inter-network or intra-network infrastructure competition has not significantly increased in Germany.

Question 13: The IDA is particularly interested in feedback on whether differential charges across classes of operators, based on the size of the customer base and the extent of new infrastructure investment, will pose problems in achieving the IDA’s objectives of actively encouraging broadband infrastructure and promoting service innovation and if there are other approaches that may be more appropriate and if so, under what circumstances.

7.2 Additional Considerations for Broadband

7.2.1 The IDA intends to take the following policy approach for the Code

Operators requesting extra functionality or modifications are typically responsible for the additional cost. However, when such functionality or modification is required to meet the obligation to provide access, the operator with the facilities is responsible for the additional cost unless the providing operator cannot benefit from the enhancement in functionality.

7.2.2 The IDA considers the above provision necessary in the broadband context to ensure that no disputes arise from the requirement to interconnect systems that may at present not allow for such interconnection. While the IDA will

⁴ Please refer to “Effective Competition in European Telecommunications: An Analysis of Recent Regulatory Developments”, *Kiessling and Blondeel, info, oct. 1999*

identify technically feasible POIs, the providing operator may have a technology platform, which does not allow interconnection.

- 7.2.3 If the providing carrier will not offer the services enabled by implementing the change in technology or cannot interconnect with VASPs to offer the services, then the cost is caused entirely by the requesting operator.

Question 13a: IDA seeks comments on the requesting operator's responsibility for charges with respect to upgrades in functionality of the providing carrier's networks in the broadband context and if there are other approaches that may be more appropriate and if so, under what circumstances.

- 7.2.4 As in the case of narrowband traditional telephony-based context type of interconnection, a carrier should be allowed to determine and set aside capacity for its own future use. This capacity does not have to be provided to other operators under the obligation to provide access. However, certain UNEs are difficult to replicate and can be treated as ESFs due to time constraints in rolling out alternative infrastructure, for example, undersea cable, long-haul terrestrial dark fibre. Excess capacity in such UNEs cannot be retained for future use, and operators should share capacity available in these UNEs.

- 7.2.5 It may also be unreasonable for new entrants to make available all excess capacity at the onset. The IDA will be looking to establish procedures where the obligations to provide capacity may be suspended for a certain period of time on a case-by-case basis.

- 7.2.6 The IDA is considering dis-allowing the use of proprietary protocols that do not allow delivery of multiple broadband services to the customer. The IDA will be looking to determine on a case-by-case basis the desired balance between adequately rewarding innovation and fostering inter-network competition.

Question 13b: IDA seeks comments on whether capacity for future use should be allowed in all types of IRSs, and whether proprietary protocols which

inhibit interconnection can be used for limited periods of time. The IDA is particularly interested to receive comments on how these issues may detract from the goal of any-to-any system and service connectivity and if there are other approaches that may be more appropriate and if so, under what circumstances.

8. REQUEST FOR COMMENTS

- 8.1 IDA hereby invites its licensees, users, and any other interested parties to submit written comments regarding the proposed interconnection and access economic regulatory framework.
- 8.2 IDA requests that commenters use the following format:
- Description of the commenting party and its interest in the proceeding;
 - General views; and
 - Comments regarding specific sections of the proposed interconnection and access regulatory framework;
- 8.3 Parties that choose to comment on specific sections of the proposed interconnection and access regulatory framework should identify the section (by number).
- 8.4 All comments should be submitted to IDA in hard copy (6 copies) and diskette (Word 97 Format). Comments may also be emailed. Comments should be clear and succinct. All written comments must be submitted to IDA by 12 noon on Monday, 22 May 2000. Comments received after 12 noon will not be accepted or considered. Comments should be addressed to:

Ms Ng Cher Keng
Director (Policy)
Infocomm Development Authority of Singapore
8 Temasek Boulevard
#14-00 Suntec Tower Three
Singapore 038988
Email: ng_cher_keng@ida.gov.sg

- 8.5 IDA will post all comments on its website www.ida.gov.sg
- 8.6 IDA will conduct a public forum regarding the proposed Code and interconnection and access regulatory framework on Monday, 15 May 2000 at the Singapore International Convention & Exhibition Centre, 1 Raffles Boulevard, Singapore 039593. The forum will begin at 8.30 a.m. and last until approximately 6.30 p.m. In the morning, IDA, its consultants, and select invited industry representatives will make presentations regarding the proposed Code and the interconnection and access economic regulatory regime. During the afternoon, IDA will conduct an open discussion with interested participants. Those who are interested to attend the forum are invited to register with:
- (i) Ms Chew Bee Leng (email : chew_bee_leng@ida.gov.sg); or
 - (ii) Ms Salbinah Mohamad (email: salbinah_mohamad@ida.gov.sg).

Please submit the names and designations of attendees. A registration fee of S\$40.00 will also be payable for each attendee. **Registration will close on 5 pm, 8 May 2000.**

- 8.7 IDA will not entertain requests for private meetings to discuss the proposed Code or interconnection and access regulatory framework.
- 8.8 Based on the written comments and the public discussion at the forum, IDA will make any appropriate modifications to the interconnection and access regulatory framework which will be incorporated in the Code. IDA anticipates releasing the Code by the third quarter 2000.
- 8.9 The Code will become effective 14 days after it has been released.

9 APPENDIX: TYPES OF OPERATORS

Reference to the Current Industry Model	Descriptor	Description	Example
Level 4 and operators not considered in previous model	Service Innovator	<ul style="list-style-type: none"> Content Provider or Application Developer or Resellers in the telecommunications, computing and broadcasting industries "System-less" service developers that deliver voice, video, text and multi-media content or provide interactive programmes either through selling a service to the other operators or buying capacity from the operators Use the systems of value added service providers, carriers, or private networks of business customers to deliver its services to business and residential customers 	<ul style="list-style-type: none"> CNBC Asia National Geographic
Level 3	Value Added Service Provider (VASP)	<ul style="list-style-type: none"> IASPs, VANs, ISRs, Audiotex, VPNS, managed data services etc. Delivers communications, computing or broadcasting services developed in-house or purchased from service innovators to customers Operates systems such as communications equipment that interconnects to carriers' facilities or private networks of business customers 	<ul style="list-style-type: none"> IASP: Pacific Century Cyberworks VANs: IBM, Sterling Commerce, and GEIS ISR: Phoenix etc.
Level 1 and 2	Carrier	<ul style="list-style-type: none"> PBTS, PMTS, PRTS, IXSPs, subscription cable, satellite uplink and downlink operators Constructs or buys raw infrastructure to build switching and transmission facilities for carrying any type of communications, <ul style="list-style-type: none"> To or from customers between two locations within Singapore; Between Singapore and places outside Singapore; Provides interconnection transit services between carriers; and Provides interconnection transit services between carriers and value added service providers Granted rights to open up roads, build ducts, access buildings and pathways for network roll-out 	<ul style="list-style-type: none"> PBTS, PMTS, PRTS: SingTel, StarHub, M1, Hutchinson Cable and satellite: SCV