



20150410/05/5B/SN/ IP TRANSIT AND PEERING LANDSCAPE

10 April 2015

Ms Aileen Chia
Deputy General Director (Telecoms & Post)
Info-communications Development Authority of Singapore

Dear Ms Chia,

SUBMISSION ON CONSULTATION ON SINGAPORE'S INTERNET PROTOCOL TRANSIT AND PEERING LANDSCAPE

1 BACKGROUND

- 1.1 SingNet Pte Ltd (**Singnet**) welcomes this opportunity to submit feedback on the Consultation Paper on the Internet Protocol Transit and Peering Landscape in Singapore (the **Consultation Paper**) issued by the Info-communications Development Authority (**IDA**).
- 1.2 Singnet is a subsidiary company of Singapore Telecommunications Limited (**Singtel**) and is one of the four major commercial Internet service providers (**ISPs**) in Singapore.
- 1.3 Singnet is committed to providing innovative, high-performance Internet services to its customers at competitive prices. Along with its parent company Singtel, Singnet has played a pivotal role in Singapore's development as a major communications hub.
- 1.4 In this submission, Singnet expresses its support for the conclusions reached by the IDA in the Consultation Paper. This submission is structured as follows:
 - Section 2 – Executive Summary of Singnet's main submissions;



- Section 3 – Singapore’s Internet interconnection services market;
- Section 4 – Singnet’s product and participation in the market;
- Section 5 – International comparisons;
- Section 6 – Singnet’s responses to the IDA’s questions.

2 EXECUTIVE SUMMARY

- 2.1 Singnet recognizes that interconnectivity is essential to the smooth running of the Internet. It supports the conclusions in the IDA’s consultation paper that the market for the supply of Internet interconnection services, including Internet Protocol (**IP**) Transit and Peering, is competitive and does not require regulation.
- 2.2 Regulation should only be imposed in a market if there is clear evidence of market failure and regulation is necessary in order to achieve the goals set out in the Code of Practice for Competition in the Provision of Telecommunications Services (2012) (the **Code**). The findings of the IDA’s study of the IP Transit and Peering Landscape (**IDA Study**) clearly demonstrate that there is no evidence of market failure in the market for the supply of Internet interconnection services. Therefore, regulation is not warranted or necessary to achieve the goals set out in the Code.
- 2.3 The IP Transit and Peering landscape in Singapore is based on private contracting in a competitive market. There are no technical barriers to ISPs making interconnection arrangements in their commercial interests, and no bottleneck associated with the supply of Internet interconnection services.
- 2.4 Singtel is one of many sources from which ISPs, Content Service Providers (**CSPs**) and Content Delivery Networks (**CDNs**) (together, **Operators**) are able to access competitively priced IP Transit services. In addition, Operators are able to access IP Peering services through a number of local Internet exchange points (**IXPs**), including Singapore Internet Exchange (**SGIX**).



- 2.5 A cross-jurisdictional survey of the state of regulation in Internet interconnection markets in other countries in the Asia Pacific region (**the Region**) shows that regulation of IP Transit and Peering is rare and limited. Regulation has only been imposed where there are clear signs of market failure, and there is no evidence that countries which have imposed regulation benefit from a more efficient market for Internet services than those which have not.
- 2.6 There is a significant risk that regulation of IP Transit and Peering would have unintended consequences that would adversely impact on the dynamism and innovation of the Internet services market in Singapore.
- 2.7 One of the goals of the Code is to “encourage, facilitate and promote investment in and the establishment, development and expansion of the information and communications industry in Singapore.”¹ The imposition of regulatory measures, may serve as a disincentive for larger ISPs such as Singnet to invest in the network infrastructure needed to deliver high performance services to end-users.
- 2.8 In particular, there is a concern that mandating multilateral peering between all ISPs would enable smaller ISPs to free-ride off investments in infrastructure and facilities made by larger ISPs, acting as a significant disincentive to such investment.
- 2.9 Free-riding occurs when one ISP gains the use of another ISP’s investment for less than would be agreed in a competitive market. The Australian Competition and Consumer Commission (**ACCC**) recognized the free-rider problem in its Draft report on whether or not an Internet interconnection service should be declared under Part XIC of the Trade Practices Act 1974 (Cth) :

¹ CI 1.2(f), Code of Practice for Competition in the Provision of Telecommunications Services 2012.



“It is to be expected that ISPs will have differing bargaining power and incentives when agreeing the terms of interconnection. Equivalent sized ISPs may have mutual incentives to interconnect and to maintain quality of service...However, when ISPs differ significantly in the number and/or value of the IP addresses on their networks, the smaller ISP may gain disproportionately from the investment made by the larger network, unless the terms of interconnection make allowance for this investment. In a relatively competitive market, it may be anticipated that terms of interconnection would reflect differentials in the benefits that each network offers to each other in an interconnection relationship.”²

2.10 Current Internet interconnection arrangements in Singapore reflect the relative costs and values of providing Internet interconnection services. The competitive nature of the market means that charges for IP Transit are fair and reasonable. Regulation that would require larger ISPs to enter into inefficient peering arrangements with smaller ISPs to peer would serve as a disincentive for larger ISPs such as Singnet to make significant investments in infrastructure and innovative services.

3 SINGAPORE’S INTERNET INTERCONNECTION SERVICES MARKET

3.1 The IP Transit and Peering Landscape in Singapore is based on private contracting in a competitive market, with no evidence of market failure. Unlike interconnection in telephony markets, Internet interconnection is characterised by a large number of alternative routes between networks and does not depend on any single player in the market. The market for interconnection between Operators is evolving and diverse. It is not a bottleneck service which warrants regulation.

² ACCC, ‘Draft Report on whether or not an Internet interconnection service should be declared under Part XIC of the Trade Practices Act 1974 (Cth)’, 13 October 2004, 65-66.



- 3.2 In recent years, the establishment of local Internet exchange points (**IXPs**), along with the growth of local caching and use of CDNs has led to Internet interconnection becoming more regionalised and less reliant on international transit, particularly transit via the US.³ The majority of international transit now occurs within the Region. The effect of regionalised transit on latency is minimal and it is unlikely to impact on the Internet experience of end-users. For example, the Round Trip Delay time (**RTT**) for traffic diverted through Hong Kong is typically <40ms compared to RTT for USA which is <200ms.
- 3.3 The price of IP Transit, both within Singapore and the wider Asia Pacific region has steadily and consistently declined over the years, as Internet traffic has become more regionalised.⁴ Along with other major cities such as Hong Kong and Tokyo, Singapore has established itself as a regional hub for the exchange and hosting of traffic. Between 2010 and 2014, the median price for IP Transit in Singapore fell from approximately \$22 to \$7 per Mbps per Month (USD), or nearly 30% annually. There is no evidence that current Internet interconnection arrangements do not reflect the relative values and costs of providing interconnection services.
- 3.4 **[Commercial-in-Confidence]**
- 3.5 **[Commercial-in-Confidence]**
- 3.6 There are multiple ISPs serving the retail market in Singapore. Larger ISPs such as SingNet and StarHub face competition from smaller but expanding providers including M1, ViewQwest, MyRepublic and SuperInternet. This reflects a vibrant and competitive Internet services market.

³ Ofcom, 'IP Interconnection: trends and emerging issues', 20 June 2012, available online at http://berec.europa.eu/files/news/ofcom_ipic.pdf.

⁴ See Code Williams, 'Intra-APAC IP-transit prices continue to slide', 22 October 2013, available online at <http://www.telecomasia.net/content/intra-apac-ip-transit-prices-continue-slide>.



- 3.7 The establishment of the SGiX has provided a central space for multilateral peering between local ISPs on a cost-recovery basis. All ISPs in Singapore have the opportunity to interconnect locally through SGiX.
- 3.8 The increasingly ubiquitous use of CDNs as a method of providing content to end users has further improved Quality of Service (**QoS**) for end users. CDNs store content locally, decreasing the need for international transit. In addition, most ISPs implement local content caching to provide a consistent end-user experience.
- 3.9 Due to the competitiveness of Singapore's Internet interconnection services market, Operators are able to make an individual commercial decision as to the most effective route to deliver traffic to end users. In most cases, any significant overseas detour of traffic is a result of the individual business decision of the ISP rather than constraints imposed by the market.

4 SINGNET'S PRODUCTS AND PARTICIPATION IN THE MARKET

IP Transit

- 4.1 Singnet offers high performance, cost efficient IP Transit services to a range of Operators in Singapore and internationally. Singnet's transit services provide access to local and global networks.
- 4.2 **[Commercial in Confidence]**
- 4.3 In addition to Singnet's transit services, the STiX also provides Operators with access to the Internet. STiX is one of the leading IP Transit service providers in the Asia Pacific Region. STiX has extensive connectivity with major Internet transit and content providers in Asia, Oceania, US and Europe.
- 4.4 **[Commercial in Confidence]**
- 4.5 Singnet has purchased global Internet access from STiX, which routes traffic from its other customers to Singnet directly, providing Singnet with



connectivity to the rest of the world. This means that Singnet can provide low latency and high reliability IP Transit services to its customers.

IP Peering

- 4.6 There are two forms of IP Peering. Multilateral peering involves an unlimited number of parties agreeing to exchange traffic on common terms subject to a single agreement. Bilateral peering involves two parties exchanging traffic on terms agreed by those parties. Both multilateral and bilateral peering arrangements are valid forms of interconnection and ISPs should be allowed to make a commercial decision as to which arrangement to adopt. Operators would negotiate peering arrangement if they of equitable size or have good contents or both. Bilateral arrangements may be more efficient for larger ISPs, while multilateral arrangements may be more efficient for small ISPs.
- 4.7 Within Singapore, Singnet peers on a bilateral basis with StarHub, PacNet and 1 Net. This provides ISPs purchasing transit services with multiple options for routing traffic through Singapore. For example, if a customer purchases transit services with StarHub, StarHub can route its traffic through Singnet, meaning that there is no need for international tromboning of traffic.
- 4.8 Since June 2010, SGIX has provided an open, neutral space for domestic multilateral peering. SGIX has lowered the barriers of entry to supply and acquire Internet interconnection services. It operates as a competitive constraint, ensuring that Singnet and other service providers continue to offer high performance, cost-effective interconnection services to Operators.



5 INTERNATIONAL COMPARISONS

Overview of IP Transit and Peering Regulation in the Region

Jurisdiction	Regulator	State of regulation	
		Mandatory multilateral peering? ⁵	Other forms of regulation (e.g. price)?
Hong Kong	Communications Authority	No	No
Malaysia	Malaysian Communications and Multimedia Commission (MCMC)	No	No
Japan	Ministry of Internal Affairs and Communications (MIC)	No	MIC regulates interconnection charges of dominant ISPs
Taiwan	National Communications Commission (NCC)	No	NCC has proposed regulation of interconnection charges of dominant ISP
Australia	Australian Competition and Consumer Commission (ACCC)	No	No

Introduction

- 5.1 Globally, interconnection between Internet networks, unlike interconnection between telephony networks, is not generally subject to access or price regulation. This is due to the fundamental structural and technical differences between the two types of networks.

⁵ Mandatory multilateral peering refers to a requirement for all ISPs to join a multilateral peering forum (e.g. an internet exchange point)



- 5.2 As the table above demonstrates, no regulator in the Region mandates multilateral peering between all ISPs. By this we mean that no regulator requires its market participants to join a multilateral peering forum, such as an IXP. There are a number of good reasons why this is the case. In particular, there is a concern that mandating multilateral peering between all ISPs would enable smaller ISPs to free-ride off investments in infrastructure and facilities made by larger ISPs, acting as a significant disincentive to such investment.
- 5.3 A number of regulators including the MCMC in Malaysia, the Communications Authority in Hong Kong and the ACCC in Australia have recognized that while interconnectivity between networks is an essential feature of the Internet, there is not a bottleneck associated with the supply of Internet interconnection services. Those countries that have imposed regulatory measures have only done so as a result of clear evidence of market failure, and it is not apparent that the regulation has been effective.

Hong Kong

- 5.4 Hong Kong has one of the most competitive internet service markets in the world, with over 185 ISPs operating in the market. The Communications Authority has not mandated multilateral peering between all ISPs or imposed any other regulation on the Internet interconnection services market.
- 5.5 The Hong Kong Internet Exchange (**HKIX**) is a multi-lateral exchange platform for the routing of intra-Hong Kong Internet traffic. The HKIX does enforce a mandatory multilateral peering policy, requiring all members to peer with all other members. However, there is no obligation on ISPs in Hong Kong to peer at the HKIX.
- 5.6 A number of major ISPs in Hong Kong do not offer open peering. For example, China Mobile Hong Kong, China Mobile International, Wharf T&T, Towngas, PCCW and Hutchison Global Communications offer only selective peering. This position reflects international practice, including the peering policy of Tier 1 ISPs in the US.



Malaysia

- 5.7 The MCMC has power under the *Communications and Multimedia Act 1998* to determine that any network facility or service should be included on an Access List and subject to regulation.⁶
- 5.8 Wholesale Internet interconnection services have not been included on the MCMC's Access List since 1 January 2011. Prior to this, an Internet Interconnection Service was included on the Access List from 2005.
- 5.9 In its 2008 Access List Review, the MCMC noted that the Internet Interconnection Service had been included on the Access List due to problems faced by smaller operators seeking Internet interconnection and the issue of inefficient routing arrangements (international tromboning) which diverted Internet traffic out of Malaysia. It concluded that, due in part to the establishment of the Malaysia Internet Exchange (**MyIX**), barriers of entry to the market for Internet interconnection services had significantly decreased in the intervening period, and accordingly, concluded that regulation should be removed from 1 January 2011.⁷
- 5.10 The MyIX is a multi-lateral exchange platform for the routing of Malaysian Internet traffic. There is no obligation on ISPs to peer at MyIX. ISPs do so as a result of their own commercial decisions.
- 5.11 In September 2014, the MCMC issued a report on Market Definition Analysis in relation to the Communications Market in Malaysia. Its analysis found that barriers to entry in the wholesale market for Internet interconnection services, including IP Transit and Peering services, are relatively low. The MCMC's report noted the existence of economies of scale in regard to Operators' ability to establish peering arrangements, but emphasised that this alone is not

⁶ Article 146, Communications and Multimedia Act 1998.

⁷ MCMC, 'Public Inquiry Report: Review of Access List and Mandatory Standard on Access', 21 December 2008, 129. Available online at http://www.skmm.gov.my/skmmgovmy/files/attachments/PI_Report_21_Dec_08.pdf.



sufficient to prevent competition in the market for interconnection services. The MCMC considered that MyIX has had a significant beneficial effect in providing all Operators with access to efficient and cost-effective Internet interconnection services.⁸

- 5.12 In its Public Inquiry Report on the Assessment of Dominance in Communications Market, also published in September 2014, the MCMC concluded that the Malaysian market for Internet interconnection services does not have a dominant operator.⁹
- 5.13 Just as the MCMC recognizes the moderating influence that MyIX has had both on facilitating interconnection between Internet service providers of varying sizes and in preventing the artificial inflation of costs by larger network operator, the IDA is correct to recognize the similar role of SGIX in the Singapore market.

Japan

- 5.14 The MIC does not mandate multilateral peering between all ISPs. As in other countries, a number of ISPs in Japan including NTT, KDDI and AT&T AP offer only selective peering.
- 5.15 The MIC regulates the prices which dominant ISP, NTT, can charge for its Internet interconnection services. The MIC has declared NTT's local networks as "Category 1 Designated Telecommunications Facilities" and requires NTT to offer non-discriminatory interconnection tariffs for service-based competitors who seek to access their network.

⁸ MCMC, 'Market Definition Analysis: Definition of Communications Market in Malaysia', 24 September 2014, 107-109. Available online at <http://www.skmm.gov.my/skmmgovmy/media/General/pdf/Market-definition-analysis-Final.pdf>.

⁹ MCMC, 'Public Inquiry Report: Assessment of Dominance in Communications Market', 24 September 2014, 108. Available online at <http://www.skmm.gov.my/skmmgovmy/media/General/pdf/PI-Report-Final-Revised.pdf>.



- 5.16 NTT has stated that regulation of its interconnection charges has caused it to lose money on its investment in FTTH infrastructure and that other providers are able to free-ride on its investment.¹⁰

Taiwan

- 5.17 Taiwan does not mandate multilateral peering between all ISPs.
- 5.18 In March 2010, the NCC amended the Regulations Governing the Tariff of Type 1 Telecommunications Business requiring dominant operator Chunghwa Telecom to disclose its prices for Internet interconnection. This amendment followed disputes in 2009 between Chunghwa Telecom and Taiwan Fixed Network Company over Chunghwa's wholesale peering tariffs, which were resolved by the NCC mediating discussions between the two operators and ultimately procuring an agreement from Chunghwa to reduce its tariff.¹¹
- 5.19 In September 2012, the NCC announced that the Regulations Governing Network Interconnections among Telecommunications Operators would be amended to require network interconnections between three major telecommunications operators, Chunghwa Telecom, Taiwan Mobile and FarEasTon, to be free of charge. In addition, the Regulations Governing the Tariff of Type 1 Telecommunications Business would be amended to grant the NCC the power to regulate the price of IP Transit fees charged by Chunghwa Telecom to other Operators.
- 5.20 The proposed amendments to the Regulations have subsequently been delayed and it is not clear whether they will be introduced.¹²

¹⁰Changes in Telecommunications and Regulatory Policy in Japan', 59 Communications & Strategies 113; Hidenori Fuke, 'Rethinking the Regulation for Wholesale FTTH Services', 11.

¹¹ NCC, Press Release, 'NCC ratifies wholesale tariffs of internet peering submitted by the Dominant Market Player of Type I telecommunications enterprises' 18 August 2009, available online at http://www.ncc.gov.tw/english/content_field_detail.aspx?site_content_sn=215&is_history=0&pages=2&sn_f=20.

¹² See International Law Office, 'NCC announces hearing on network interconnections' 24 April 2013 <http://www.internationallawoffice.com/Newsletters/Detail.aspx?q=4d192af4-70d5-4743-b641-9a4062935fae>.



Australia

- 5.21 Australia does not mandate multilateral peering between all ISPs.
- 5.22 The ACCC may declare certain telecommunications services under Division 2 of Part XIC of the *Competition and Consumer Act 2010*. Declared services being subject to regulation. The ACCC will only declare a service if it considers that regulation is needed to promote competition in the long-term interests of end-users.
- 5.23 IP Transit and IP Peering are not currently declared services. In 1998, responding to concerns regarding the market power of then majority state-owned Telstra, the ACCC issued a Competition Notice mandating that Telstra peer with the other Tier 1 ISPs in the market at the time (Optus, which is now owned by Singtel, Ozemail and Connect.com.) on a non-settlement basis. However, the regulation did not require the four large ISPs to peer with smaller ISPs.
- 5.24 Subsequent industry development made the ACCC's intervention redundant, as it became apparent that the Competition Notice did not address the issue of interconnection between large and small ISPs. This experience demonstrates the fact in dynamic, evolving industries, such as the market for Internet services, regulation is often ineffective, and in many cases counterproductive, as it is directed backwards at historical problems and does not anticipate future technological and business developments.
- 5.25 In February 2003, the ACCC announced that it would conduct a formal inquiry into whether or not an Internet interconnection service should be declared under Part XIC. On 1 January 2005, the ACCC published its final report which concluded that regulation was not necessary. The ACCC recognized some concerns regarding the ability of smaller ISPs to enter into cost-effective interconnection arrangements with Tier-1 ISPs, but concluded



that there was not sufficient evidence to show that regulation would be in the long term interests of end-users.¹³ Instead, the ACCC implemented a targeted monitoring program, focused on behaviour in the market that might indicate the use and effect of market power.

5.26 There have been no subsequent moves to regulate the Internet interconnection market.

6 SINGNET'S RESPONSES TO THE IDA'S QUESTIONS

6.1 Singnet would like to provide the following brief responses to the questions asked by the IDA in Part III of the Consultation Paper.

(a) **Singnet's comments on the findings from the IDA study on the current market conditions in the Singapore Internet services market**

6.2 Operators in Singapore do not face any barriers to acquiring IP Transit services on reasonable commercial terms. The IDA study found that Singapore has one of the most competitive wholesale IP Transit markets in the Region, with Operators able to obtain interconnection from multiple sources. The price of IP Transit services in Singapore has been declining in recent years.

6.3 In the Singapore market, the proportion of local Internet traffic remains relatively small, representing only approximately 5% of total traffic. This can be contrasted with other countries in the Region such as Hong Kong where the majority of Internet traffic is local.

6.4 In regard to the issue of international tromboning within the Region, the majority of traffic diversions are through Hong Kong, with the impact on latency insignificant. As stated above, the Round Trip Delay time (RTT) for traffic diverted through Hong Kong is typically <40ms compared to RTT for

¹³ ACCC, Final Report on whether or not an Internet interconnection service should be declared under Part XIC of the Trade Practices Act 1974 (Cth)', December 2004, 16-17.



USA which is <200ms.

- 6.5 The conditions for IP Peering arrangements in the Singapore market are comparable with other countries such as the US, Hong Kong and Australia, and reflects international practice. In the US, Tier-1 ISPs have a strict peering policy which requires networks to be of equal size in terms of setup and customer base. Australia has a similar peering policy as the US, with only the four largest ISPs offering free peering to each other. In Hong Kong, China Mobile Hong Kong, China Mobile International, Wharf T&T, Towngas, PCCW, and Hutchison Global Communications offer only selective peering. In Japan, NTT, KDDI and AT&T AP offer only selective peering.
- 6.6 Operators have multiple options to enhance their end-users' Internet experience. Many ISPs implement content caching to provide a consistent experience regardless of the content's geographic origin. CSPs also have the option to use third party CDNs such as Akamai to deliver their content to end users. Increasing amounts of content is stored and delivered through cloud-based services, as technology shifts towards mobility, OTT and streaming.
- (b) **Have the current conditions for IP Transit and Peering resulted in any negative impact on competition, or hindered the ability of ISPs, ICPs or CDNs to offer services?**
- 6.7 Singnet is not aware that the current conditions for IP Transit and Peering have resulted in any negative impact on competition, or hindered the ability of ISPs, ICPs or CDNs to offer services. As stated above, Operators have multiple options to innovate and enhance their end-users' Internet experience.
- (c) **Is the quality of ISPs' service offerings negatively affected by today's IP Transit and Peering landscape?**
- 6.8 Singnet is not aware that any ISPs' service offerings have been negatively affected by today's IP Transit and Peering landscape. There is no significant negative impact on local traffic, as Operators are able to make a commercial



decision as to whether it is more cost effective for them to purchase IP Transit services or enter into alternative arrangements.

6.9 Most ISPs have implemented content caching to provide a consistent user experience regardless of geographic location of content. The fact that certain ISPs are able to offer gaming plans with low latencies clearly demonstrates that the current landscape creates the opportunity for ISPs to innovate and provide high performance services. There is a concern that unnecessary regulation could stifle innovation.

(d) Has the cost of IP Transit as a proportion of other operating costs fallen or increased significantly for Operators?

6.10 As stated above the cost of IP Transit in Singapore has decreased by approximately 30% on an annualised basis over the last 5 years. Therefore, it is to be expected that IP Transit has decreased as a proportion of other operating costs for Operators.

(e) Are there other factors that IDA should consider in assessing the local IP Transit and Peering landscape?

6.11 The IDA should support the legitimate commercial interests of ISPs of all sizes. In regard to large ISPs, such as Singnet, it is appropriate that interconnection costs reflect the per unit costs of providing the interconnection service. It is the legitimate commercial interest of Singnet to charge higher Transit fees for low volumes of traffic from small ISPs and enter into Peering arrangements with high traffic Tier-1 ISPs in order to minimize its own costs.

6.12 The IDA should also consider possible unintended consequences of regulation. The rise of CDNs and other alternatives to paying directly for Transit services demonstrates the highly innovative, dynamic nature of the market at present.



6.13 The imposition of regulatory measures, such as the IDA mandating IP Peering arrangements between all local ISPs, may disincentive larger ISPs such as Singnet from investing in the network infrastructure needed to deliver high performance services to end users. Mandating IP Peering between all Operators would risk introducing a free-rider problem, whereby smaller ISPs are able to free-ride on the substantial investments made by larger ISPs.

(f) What are the possible areas in the local IP Transit and Peering landscape that would require regulatory intervention, and why?

6.14 The IP Transit and Peering landscape in Singapore is dynamic and competitive. The competitive nature of the market means that charges for Transit are fair and reasonable. There is no need for regulatory intervention.

6.15 Please do not hesitate to contact us if you would like to discuss our submission or require any further information. Thank you.

Yours sincerely,

Sean Slattery
Vice President
Regulatory & Interconnect