

SINGTEL

RESPONSE TO IDA PUBLIC CONSULTATION PAPER – INTERNET PROTOCOL “NO ISLANDING” PRINCIPLE

1. INTRODUCTION

- 1.1. Singapore Telecommunications Ltd, SingTel Mobile Singapore Pte Ltd and SingNet Pte Ltd (collectively **SingTel**) refer to the Info-communications Development Authority of Singapore (**IDA**) consultation paper dated 20 June 2011 on the Internet Protocol “No Islanding” Principle (**Consultation Paper**).
- 1.2. SingTel has a comprehensive portfolio of services that includes voice and data services over fixed, wireless and Internet platforms. SingTel is a leading provider of mobile telecommunications services over 2G and 3G networks, high speed data services through General Packet Radio Service (**GPRS**) and High-Speed Packet Access (**HSPA**) technology and wireless services on our WiFi platform. SingTel is also a leading Internet Access Service Provider (**IASP**) in Singapore and has been at the forefront of Internet innovation since 1994, being the first IASP to launch broadband services in Singapore. SingTel offers a comprehensive suite of broadband Internet services delivered both over the Digital Symmetrical Line (**DSL**) and fibre technologies. SingTel is also licensed to offer IPTV services under a nationwide subscription television licence granted by the MDA.
- 1.3. SingTel provides services to both corporate and residential end-users and is committed to bringing the best of global communications to its end-users in the Asia Pacific and beyond.
- 1.4. SingTel is committed to the provision of state-of-the-art telecommunications technologies and services in Singapore and welcomes the opportunity to make a submission in response to the Consultation Paper issued by the IDA.
- 1.5. This submission is structured as follows:

Section 1 – Introduction

Section 2 – Executive Summary

Section 3 – Specific Responses

Section 4 – Conclusion

2. EXECUTIVE SUMMARY

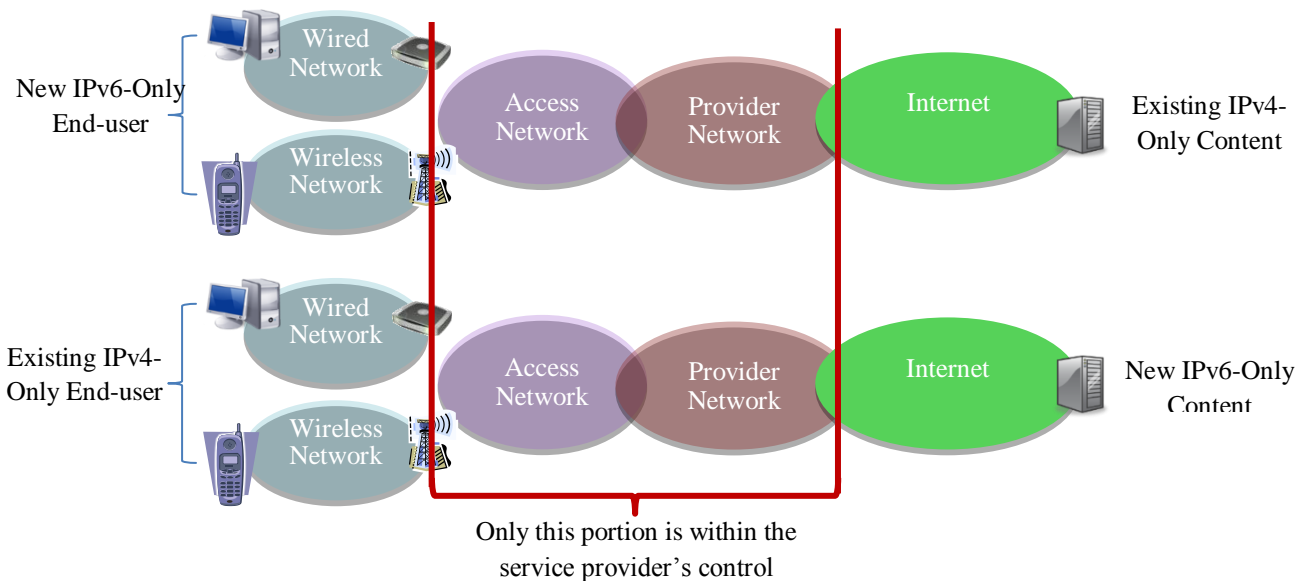
- 2.1. SingTel foresees that it will take approximately five (5) years or more for the industry to reach a stage when the IASPs' available pool of public IPv4 addresses are exhausted and IASPs begin allocating IPv6-only addresses to new end-users and/or new content providers.
- 2.2. SingTel is of the view that market forces will drive IASPs and content providers to provide content and services over both IPv4 and IPv6 in order to maintain their end-users.
- 2.3. SingTel submits that while IASPs can implement translation technology to ensure seamless access across the existing networks, it is important to note that IASPs only have control over a small portion of the connectivity between the end-user and the Internet.
- 2.4. SingTel submits that IASPs and content providers can avoid "islanding" by adopting translation mechanisms such as dual-stack, dual-stack lite, NAT64 or A+P etc. to ensure seamless content between an IPv6-only client and an IPv4-only service and vice versa.
- 2.5. SingTel submits that there is no need for IDA intervention to ensure that IASPs provide seamless Internet connectivity during IPv6 transition.
- 2.6. SingTel strongly believes that market forces are sufficient to drive IASPs and content providers to provide Internet connectivity and access to content over both IPv4 and IPv6.

- 2.7. SingTel further submits that any intervention by the IDA may be counter-productive and hinder the IASP or content provider from developing and offering new and innovative services that differentiate their offerings in the market.
- 2.8. SingTel submits that it is not necessary to impose the IP “No Islanding” Principle so long as the end-user has a choice of opting for either dual-stack services or IPv6 services depending on the end-user’s requirements.
- 2.9. SingTel believes that “islanding” may still occur in end-user-to-end-user applications even if translation mechanisms are put in place.
- 2.10. SingTel submits that imposing the IP “No Islanding” Principle would only serve to hinder the development and offering of new and innovative services regardless of whether the Principle is applied to residential end-users, business users or both.
- 2.11. SingTel submits that seamless Internet access independent of the IP used requires end-users to also ensure that their end-user equipment such as mobile handset, router, CPU etc. is able to support translation technology.
- 2.12. SingTel supports the IDA decision not to apply the IP “No Islanding” Principle to Internet Exchanges (**IXs**).
- 2.13. SingTel submits that the cost will be significantly lower if the implementation of technical solutions for seamless internet connectivity is allowed to continue as part of the technology refresh cycle over the years.
- 2.14. SingTel submits that embarking too quickly on a new technology may result in increased investment cost should technology trends change or problems surface with the technology.
- 2.15. SingTel submits that the IP “No Islanding” Principle is not necessary and therefore does not support the IDA proposal to impose such a requirement on the industry. Market forces are sufficient to encourage IASPs and content providers ensure seamless internet connectivity and access over both IPv4 and IPv6.

3. SPECIFIC RESPONSES

(a) IDA invites views and comments on the likelihood of “islanding” occurring to Singaporean end-users, irrespective of wired, wireless or mobile modes of Internet access. To what extent can the existing networks prevent the occurrence of “islanding” and ensure that Internet access is seamless independent of the IP used?

- 3.1. SingTel foresees that it will take approximately five (5) years or more for the industry to reach a stage when the IASPs’ available pool of public IPv4 addresses are exhausted and IASPs begin allocating IPv6-only addresses to new end-users and/or new content providers.
- 3.2. SingTel is of the view that market forces will drive IASPs and content providers to provide content and services over both IPv4 and IPv6 in order to maintain their end-users. However, we acknowledge that there is a possibility for the development of a niche market for IPv6-only services which might result in “islanding”. An IPv6 only service incurs lower costs as compared to a service that is offered over both IPv4 and IPv6 as translation technology will not be necessary hence making IPv6-only services an attractive option.
- 3.3. SingTel submits that while IASPs can implement translation technology to ensure seamless access across the existing networks, it is important to note that IASPs only have control over a small portion of the connectivity between the end-user and the Internet (see diagram). Ensuring seamless Internet access between the end-user equipment and the content provider will require a collective end-to-end effort from the end-user, the service providers and the content providers to prevent any occurrence of “islanding”.



- 3.4. SingTel submits that IASPs and content providers can avoid “islanding” by adopting translation mechanisms such as dual-stack, dual-stack lite, NAT64 or A+P etc. to ensure seamless content between an IPv6-only client and an IPv4-only service and vice versa. However, the success of this solution is dependent on the terminal capabilities of the end-user equipment such as mobile handset, router, CPU etc.
- 3.5. SingTel has begun the task of implementing translation technology on parts of our networks and will continue doing so to ensure that there is a seamless transition from IPv4 to IPv6 for our residential end-users for as long as possible.

(b) IDA also invites views and comments on the need for IDA to ensure that the IASPs provide seamless Internet connectivity during IPv6 transition.

- 3.6. SingTel submits that there is no need for IDA intervention to ensure that IASPs provide seamless Internet connectivity during the transition to IPv6. SingTel strongly believes that market forces are sufficient to drive IASPs and content providers to provide Internet connectivity and access to content over both IPv4 and IPv6. The IASP market is highly competitive. Consistent with the Regulatory Principle in respect to the reliance on market forces in Section 1.5.1 of the Code of Practice for Competition in the Provision of Telecommunication Services 2010, market forces should be allowed to operate:

Reliance on Market Forces

Market forces are generally far more effective than regulation in promoting consumer welfare. Competitive markets are most likely to provide consumers with a wide choice of services at just and reasonable prices. Therefore, to the extent that markets or market segments are competitive, IDA will place primary reliance on private negotiations and industry self-regulation, subject to minimum requirements designed to protect consumers and prevent anti-competitive conduct. [emphasis ours]

- 3.7. There is no evidence of market failure in relation to the transition from IPv4 to IPv6 to even remotely suggest that IDA intervention is necessary. As indicated earlier, SingTel has already begun implementing translation technology on parts of our networks and we believe other IASPs would also have initiated similar updates on their networks therefore it would be inappropriate and unwarranted for the IDA to intervene at this stage.
- 3.8. SingTel further submits that any intervention by the IDA may be counter-productive and hinder the IASP or content provider from developing and offering new and innovative services that differentiate their offerings in the market.

(c) IDA invites views and comments on the scope of the IP “No Islanding” Principle. What are the possible technical options for IASPs to achieve “no islanding” and what is the possible impact to end-users during implementation?

- 3.9. Please refer to paragraph 3.6.
- 3.10. SingTel submits that it is not necessary to impose the IP “No Islanding” Principle so long as the end-user has a choice of opting for either dual-stack services or IPv6 services depending on the end-user’s requirements.
- 3.11. For existing IPv4-only Internet access, the possible technical options include the IASP implementing dual-stack at the Access Network, Provider Network and over Internet peering. However, “No Islanding” can only be achieved if the end-user’s LAN

devices such as CPU, firewall, router, etc. are also dual-stack ready. We note that there is no translation standard for NAT46 at this moment.

- 3.12. For new IPv6-only Internet access [in the future when IASPs run out of IPv4 public addresses], we note that it is not feasible to implement Dual-Stack unless the IASP deploys NAT444 to offer IPv4 private address, which is not advisable due to scalability issues. A possible option would be implementing the IETF RFC6146 translation standard for NAT64 which worked together with DNS64 [published in April 2011]. However, this solution only translates an application using the domain name instead of a hard-coded IPv4 address which may not be feasible for other applications that hard-code the IPv4 address.
- 3.13. We note that there are a number of technical options available today however, such technology are currently based on draft Request for Comments (**RFCs**) and are not technical standards yet therefore the solutions available for each technical option vary between vendors. Given that these technologies are relatively new, the possible impact to end-users is not fully understood.

(d) IDA also invites views and comments on the types, nature and categories of applications, content and services that would experience “islanding” even if translation mechanisms are put in place, and the corresponding reasons for why “islanding” would still occur.

- 3.14. SingTel believes that “islanding” may still occur in end-user-to-end-user applications even if translation mechanisms are put in place. The cause varies with each application for example, the application may embed the IP address in the payload which may not be translated or the application may use specific IPv6 attributes that are not compatible with IPv4 headers.

(e) IDA invites views and comments on the limitation of the IP “No Islanding” Principle on only IASPs offering services to residential or non-corporate end-users. Should “no islanding” apply equally in relation to business users?

- 3.15. Please refer to paragraphs 3.6 and 3.10.

- 3.16. SingTel submits that imposing the IP “No Islanding” Principle would only serve to hinder the development and offering of new and innovative services regardless of whether the Principle is applied to residential end-users, business users or both.

(f) IDA invites views and comments on the applicability of the IP “No Islanding” Principle to all residential end-users using wired and wireless Internet access, including individual or non-corporate mobile broadband users.

- 3.17. Please refer to paragraphs 3.3, 3.4 and 3.13.

- 3.18. SingTel submits that seamless Internet access independent of the IP used requires end-users to also ensure that their end-user equipment such as mobile handset, router, CPU etc. is able to support translation technology. Therefore it is critical for the IDA to engage end-users and provide public education on the impact of the transition to IPv6.

(g) IDA also invites views and comments on the non-applicability of the IP “No Islanding” Principle to IXs.

- 3.19. SingTel supports the IDA decision not to apply the IP “No Islanding” Principle to IXs.

(h) IDA invites views and comments on the possible costs of implementing technical solutions to support the IP “No Islanding” Principle.

- 3.20. We foresee that the cost of supporting the IP “No Islanding” Principle will be significant (in terms of millions of dollars) especially given the short timeline of 1 September 2012 by which the IDA proposes to impose the IP “No Islanding” Principle.

- 3.21. SingTel submits that the cost will be significantly lower if the implementation of technical solutions for seamless Internet connectivity is allowed to continue as part of the technology refresh cycle over the years.

- 3.22. Should IASPs be required to invest a substantial amount towards supporting the IP “No Islanding” Principle, the costs incurred will inevitably be passed on to the end-

users. We therefore request that the IDA consider funding in part/whole the IASPs' implementation costs to alleviate the financial burden.

- 3.23. Without prejudice to paragraphs 3.6 and 3.10, should the IDA apply the IP “No Islanding” Principle on IASPs, SingTel proposes that the timeline be extended *at least* a further 18 months to allow for the development of technical standards, for the subsequent development of equipment/ solutions for the respective standard(s) and to give the IASPs sufficient leadtime to implement the requisite network changes.

(i) IDA invites views and comments on whether there are other non-cost considerations when implementing technical solutions to support the “no islanding” principle, what those considerations are, and why they apply to the situation.

- 3.24. The maturity of technology is a critical consideration when adopting the technical solutions to ensure seamless Internet connectivity. Early adopters of the new technologies cited in paragraph 3.4 may face previously unknown problems which may in turn aggravate the effects of “islanding” by isolating a particular end-user to either IPv4 or IPv6 services/ content only.

- 3.25. SingTel submits that embarking too quickly on a new technology may result in increased investment cost should technology trends change or problems surface with the technology.

(j) IDA also invites views and comments on the proposed timeline for the start date of the IP “No Islanding” Principle.

- 3.26. Please refer to paragraphs 3.6 and 3.10.
- 3.27. SingTel submits that the IP “No Islanding” Principle is not necessary and therefore does not support the IDA proposal to impose such a requirement on the industry. Market forces are sufficient to encourage IASPs and content providers ensure seamless Internet connectivity and access over both IPv4 and IPv6.
- 3.28. Instead, the IDA should create awareness and educate residential end-users on the IPv4 to IPv6 transition and the need to use the right equipment, implementation of dual-stack on residential broadband networks etc. to avoid “No-Islanding”. SingTel also suggests that the IDA collaborate with the Media Development Authority to

encourage content providers hosted in Singapore to ensure that their networks are dual-stack ready.

- 3.29. Without prejudice to paragraphs 3.6 and 3.10, SingTel submits that the “No-Islanding” principle should not be a blanket implementation; it should be implemented in phases with priority placed on content providers identified through selected scenarios based on IPv6 technology readiness.

4. CONCLUSION

- 4.1. In light of the above, SingTel submits that it is not necessary for the IDA to impose an IP “No Islanding” Principle to ensure seamless Internet connectivity during the IPv6 transition.
- 4.2. Further, SingTel submits that the translation technologies to ensure seamless Internet connectivity are still at a relatively untested stage and imposing a deadline of less than one (1) year may result in substantial investments into ineffective solutions the cost of which will be passed on to the end-user. Therefore, IASPs would not be able to comply with a blanket “No Islanding” Principle by using only the currently available technologies to address all possible scenarios.
- 4.3. SingTel submits that market forces will ensure that IASPs and content providers ensure seamless Internet connectivity and access whilst not restricting the potential development of niche IPv6-only services.
- 4.4. Without prejudice to the above, should the IDA still intend to implement a “No Islanding” Principle then it should be a conditional principle based on the readiness and availability of IPv6 technologies for residential end-users, network providers and content providers.