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Our ref: Singtel/IMDA/21/022

24 May 2021

Director-General (Telecoms & Post)
Deputy Chief Executive (Connectivity Development & Regulation)
Info-communications Media Development Authority of Singapore

Dear Ms Chia

CONSULTATION ON IMPLEMENTATION OF IP-BASED INTERCONNECTION IN SINGAPORE

1.   Singapore Telecommunications Ltd (**Singtel**) welcomes the opportunity to respond to the Info-communications Media Development Authority of Singapore's (**IMDA**) request for comments on consultation IP Based interconnection in Singapore set-out in the consultation paper issued by the IMDA on 1 March 2021 (**Consultation Paper**).

2.   Singtel submits our comments to the Consultation Paper in **Annex 1**.

3.   Please do not hesitate to contact us if you have any queries or require further clarification.

4.   Thank you.

Yours sincerely

Sean Slattery
Vice President
Regulatory and Interconnect
Encl.

CONSULTATION ON IMPLEMENTATION OF IP-BASED INTERCONNECTION IN SINGAPORE

1.   Singtel's submission in response to the Consultation Paper is structured as follows:

- Background/Statement of Interest

- Executive Summary

- Specific Comments

- Conclusion

Background/Statement of Interest

2.   The Singtel group provides a comprehensive portfolio of services that include voice, data and internet services to both corporate and residential customers across Singapore over a variety of platforms, including the Next Generation Nationwide Broadband Network (**NGNBN**).

3.   Singtel welcomes the opportunity to respond to the IMDA's consultation on implementation of IP based interconnection in Singapore.

4.   Singtel, having established and maintained interconnection with most of the Licensees in Singapore believes that we must offer to take a leading role in implementing IP-based interconnection for any-to-any voice communication in Singapore.

Executive Summary

5.   Singtel makes the following key points in this submission:

(i)   The Licensees should follow a standardised set of technical requirements to implement IP based interconnection at the domestic points of interconnection (**POI**) across all operators' networks;

(ii)   it is appropriate to implement SIP based on IETF specifications;

(iii)   Dominant Licensee should offer the final IP-based interconnection based on the set of technical requirements and the SIP IETF specification in its RIO;

(iv)   There is a need to further study into implementing a new Fixed Number Portability (**FNP**) solution in IP-based interconnection;

(v)   Licensees should continue with the same interconnection method in order to ensure security and Quality of Service; and

(vi)   IMDA should review its preliminary views on the broad migration approaches to take into consideration of the support of existing services, migration process and timeline.

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Specific Comments:

Question 1: IMDA invites views and comments on whether operators should follow a standardised set of technical requirements to implement IP-based interconnection at the domestic Points-of-Interconnection across all operators' networks that are interconnected to provision voice services

6. Singtel agrees that Licensees must follow a standardised set of technical requirements to implement IP-based interconnection at the domestic points of interconnection of the Dominant Licensee. A standardised set of technical requirements will promote seamless, efficient and expeditious interconnection for all Licensees and further reduce the challenges arise from interoperability issues.

7. Singtel submits that it is inefficient to develop customised bi-lateral technical requirements between each and every interconnected Licensee. If the Licensee is unable to meet the Dominant Licensee's standardised technical requirements, the Licensee may consider indirect interconnection which is already available.

8. Singtel proposes that the Dominant Licensee, who has interconnected and maintained interconnection with most other Licensees in Singapore, should develop and publish the standardised set of technical requirements that will cover the fundamental information such as signalling used for interconnection, routing procedures, architecture and the locations of its POIs.

Question 2: IMDA invites views and comments on whether the Proposed SIP, based on IETF and 3GPP specifications, is appropriate and suitable to be implemented at the Points-of-Interconnection

9. IMDA is aware that SIP standards have been standardised primarily by the Internet Engineering Task Force (**IETF**), and are the most widely adopted protocol by the industry and equipment vendors.

10. In this regard, Singtel is of the view that SIP, based on IETF specifications, is the most relevant, appropriate and suitable to be implemented at the Points-of-Interconnection. Singtel will implement the SIP IETF standards.

Question 3: IMDA invites views and comments on the proposed approach to finalise the offerings of the RIO services related to IP-based interconnection, before commencing the migration to IP-based interconnection.

11.   In order to maintain the integrity of the domestic interconnected networks in Singapore, Singtel submits that Singtel, being the Dominant Licensee, should take the lead in developing a standardised set of technical requirements and the SIP IETF specification for the industry. Singtel will offer the final IP-based interconnection based on the set of technical requirements and the SIP IETF specification in its RIO.

12.   As the IMDA is aware, even between two Licensees interconnected using Session Border Controller (**SBC**) peering, details such as, the handshaking protocol and etc. will need to be standardise prior to establishing interconnection.

13.   In this regard, it is crucial to finalise the RIO offerings on IP-based interconnection so as to provide clarity to the industry on the technical specifications and commercial obligations before commencing any migration to IP-based interconnection.

Question 4: IMDA invites views and comments on the feasibility of IMDA's proposals to revise the technical implementation of Fixed Number Portability service in an IP-based interconnection environment.

14.   As the IMDA is aware, the FNP service is currently implemented using an Intelligent Network solution based on the Query-on-Release (**QoR**) method. The current signalling option used to support the QoR method is based on SS7 signalling. Each Licence operates its own database as the solution requires the originating network operator/Licensee to query its database for the routing number to route the call to the port in Licensee.

15.   Currently, Licensee's operating SIP enabled network supports FNP solution based on QoR method via Sigtran[1] in MTP Level 3 User Adaption Layer (**M3UA**) for the IP connectivity. However, the IP-based Interconnection standard using SIP IETF will not support QOR method.

16.   In this regard, the industry will no longer be able to implement QoR method via Sigtran in M3UA for the IP connectivity under the SIP IETF environment. Hence, there is a need to further study into implementing a new FNP solution.

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[1] SIGTRAN is a protocol suite to transport signaling protocols over IP, and it is an extension of the SS7 protocol family.

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17. The industry will need to review the signalling function and the routing method of the new FNP solution so as to assess the technical feasibility, requirements and the costs of implementation. To ensure seamless implementation, the industry may need to test new FNP solution on a SIP IETF interworking environment as well as test the FNP interoperability between different Licensees operating SS7 and SIP IETF, as logistically, it is impossible to migrate all Licensees into a SIP IETF environment on the same day.

18. Singtel proposes that the IMDA issue a closed consultation on developing a new FNP solution prior to concluding its decision on implementing IP based interconnection.

19. Notwithstanding the above, IMDA must be mindful that the mobile Licensees will also need to review the mobile number port solution with the change from SS7 to SIP environment.

Question 5: IMDA invites views and comments on IMDA's preliminary views on network security and Quality of Service under an IP-based interconnection environment.

20. As IMDA is aware, interconnection is implemented on using direct point-to-point physical link. This is the most secured interconnection method. Singtel proposes to continue with the same interconnection method in order to ensure security and Quality of Service as each licensee already has its cybersecurity approaches and set up in place for its own network.

21. In addition, each licensee should implement the necessary network security and firewall on its side of the Point of Interconnection and each Licensee should continue to undertake to protect their own network and prevent causing technical harm to the interconnected telecommunication network of another Licensees.

Question 6: IMDA invites views and comments on IMDA's preliminary views on the broad migration approach

22. As discussed above, Singtel submits the IMDA should not proceed with its preliminary views on the broad migration.

23. Instead, IMDA should first issue a closed consultation on FNP prior to concluding its decision on implementing IP based interconnection.

24. Singtel, as a Dominant Licensee, will develop and publish a standardised set of technical requirements that will cover the fundamental information such as signalling used for interconnection, routing procedures, architecture and the locations of its POIs.

25.   Subject to finalising a viable and cost efficient new FNP solution, Singtel will proceed to offer IP-based interconnection based on the finalised set of technical requirements and the SIP IETF specification in its RIO.

26.   In relation to the migration process, Singtel as a Dominant Licensee, will work closely with the IMDA to develop a migration plan for all Licensees who are interconnected with the Dominant Licensee. Singtel [≈≈≈-e] has undertaken many major migration projects, including interconnection migration with StarHub Limited [≈-4e], and is the most experience in developing a migration plan. In developing the migration plan, Singtel submits that a reasonable time must be given to each Licensee to prepare and be ready for the eventual migration to the IP based interconnection with the Dominant Licensee.

27.   The migration plan would minimally include the following to mitigate the migration risk. Dominant Licensee to:

    (i)   migrate one Licensee at any one time;

    (ii)   establish, test and maintain both SS7 and IP-based interconnection prior to migration;

    (iii)   test interconnection overflow mechanism and including FNP solution to ensure resiliency and interoperability;

    (iv)   migrate small number of traffic progressively (at E1 level); and

    (v)   monitor the network/services after each migration

28.   Singtel further submits that there is no need to carry out a trial migration. Singtel will prepare a test switch to verify and test each Licensee's IP-based switches prior to implementing IP-based interconnection with Singtel.

29.   Lastly, as the IMDA would appreciate that the nationwide migration is a challenging and massive exercise and will involve many considerations for each Licensee to plan, implement and operationalise the changes, including the new FNP solution. Licensees would have to take into consideration its customer experience during migration, the costs and network security issues. As such, sufficient time will have to be catered for each individual licensee's preparation, obtain internal approval for the necessary budget and procurement of necessary hardware and/or systems, and careful planning and co-ordination amongst all licensee to ensure a successful migration.

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Conclusion

30.   Singtel submits that:

(i)   The Licensees should follow a standardised set of technical requirements to implement IP based interconnection at the domestic points of interconnection across all Licensees' networks so as to ensure a seamless migration to IP based network with minimal changes to the network configuration, minimal service disruption and lower the migration risks;

(ii)   Singtel will implement the SIP IETF standards at the Points-of-Interconnection;

(iii)   It is crucial to finalise the RIO offerings on IP-based interconnection so as to provide clarity to the industry on the technical specifications and commercial obligations before commencing any migration to IP-based interconnection;

(iv)   IMDA should issue a closed consultation on developing a new FNP solution prior to concluding its decision on implementing IP based interconnection;

(v)   Licensees should continue with the same interconnection method in order to ensure security and Quality of Service and, to implement the necessary network security and firewall on its Point of Interconnection; and

(vi)   Dominant Licensees like Singtel should work closely with the IMDA to develop a migration plan for all licensees interconnected with Dominant Licensee. Also, the migration process is time consuming and tedious process and many factors from technical to consumer issues/experience shall be taken into consideration.

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