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# Design of IP Interconnection Regulation For Multiplication Indonesia Telecommunication

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**Abstract.** The telecommunications network is changing from TDM-based legacy to IP, which is designed to improve capacity, improve quality and efficiency, and provide more diverse and integrated services. IP technology supports the presence of new services demanding wide bandwidth, high data rates, global connectivity, investment and operational cost savings, backbone network efficiency, and support for convergence. The interconnection technology also changed from TDM based to IP based interconnection. IP-based interconnection can ensure the occurrence of any-to-any and end-to-end relationships, as well as non-discriminatory behaviors that are cost-based and maintain a healthy competitive climate. Future interconnection parameters must be able to anticipate multi-service environments, any-to-any, and not just network to the network again, but also to network to applications and between applications. Indonesia has not yet initiated IP -based interconnection. In this research will be an academic study of telecommunication operator infrastructure readiness to IP -based interconnection, migration strategy, and regulatory proposals. The study was conducted by conducting IP -based interconnection comparisons in several other countries, conducting focus group discussions and deep interviews with stakeholders including regulators, operators and vendors. The resulting studies include a migration strategy towards IP -based interconnection and proposed regulatory aspects that must be present. From the results of the study found that IP -based interconnection should be done gradually by considering the readiness of operators, interconnection with the concept of hubbing / IPX is an effective way to go based on IP.

## 1. Introduction

The development of telecommunication networks and services is very fast and dynamic that is influenced by the rapid development of telecommunications technology and more sophisticated. The major evolution of telecommunication network technology is the shift from TDM-based legacy network to IP-based network convergence that is capable of handling a variety of services, supporting narrow bands to broadband multimedia. TDM-based network services are limited to voice services for fixed networks as well as voice and SMS services on mobile cellular networks. The TDM interconnection networks has characteristics such as requiring dedicated networks, depending on the location of interconnection, termination based, simple and no interoperability problems. Interconnection among telecommunication operators is regulated in Law no. 36 of 1999 on Telecommunications, Article 25 stating that each telecommunication network operator is entitled to interconnection from other telecommunication network providers<sup>1</sup> and Decree of the Minister of Communication and Information Technology no. 8/2006 on interconnection<sup>2</sup>. Interconnection shall



uphold the principles such as transparency, non-discrimination and the provision of interconnection from income-based to cost-based interconnection calculated on the basis of network elements used. Current TDM interconnections have limitations that can't meet the requirements of modern telecommunications.

The development of modern telecommunication technology is now towards IP-based designed to improve capacity, improve quality and efficiency, and provide more diverse and integrated services. Interconnection technology is also transformed into IP-based interconnects that have packet switched-based characteristics, are not location-sensitive, inter-service level interoperability is related to QoS and security, and traffic-oriented management. IP-based interconnection can ensure the occurrence of any-to-any and end-to-end relationships, as well as non-discriminatory behaviors that are cost-based and maintain a healthy competitive climate. Currently IP interconnections in Indonesia have not been regulated. The existing interconnection is TDM interconnection for network to network for voice and SMS service. Future interconnection should be able to anticipate interconnection between network and application, and interconnection between applications. In order to anticipate the impact of interconnection change, it is necessary to propose a study for IP interconnection regulation in the era of broadband multimedia. It is therefore very interesting to conduct an academic study of IP interconnection regulation for telecommunication operators in Indonesia. This research will be an academic study of telecommunication operator infrastructure readiness to IP interconnection, migration strategy towards IP interconnection, and regulatory proposals. The study was conducted by conducting IP interconnection comparisons in several other countries, conducting focus group discussions and deep interviews with stakeholders including regulators, operators and vendors. The resulting studies include a migration strategy towards IP interconnection and proposed regulatory aspects that must be present.

## **2. Toward Interconnection**

Various countries have conducted IP interconnection studies that have become the reference and consideration of the world's various operators for the migration of technologies and infrastructure to IP networks. In addition to the consideration for the regulators of various countries in preparing regulations and policies to support the implementation of IP interconnection. Mobile operators in India take considerable risks in investing for network upgrading to IP simultaneously. On the other hand, if the operator does not migrate to IP, the operator becomes less competitive because it is unable to provide new services, network costs are more expensive because it manages two different networks that require more complex internetworking. IP interconnection allows the reduction of transmission costs, improves efficiency and quality, and allows to cover all costs. The recommended strategy is to encourage all operators gradually to IP networks, once ready for new IP-based interconnects to run, or by introducing IP-based interconnects using hubbing/IPX.

Danish regulators conduct evolutionary strategies towards IP interconnection with stages to TDC operators as of January 1, 2012 must provide IP interconnection, while Colt, Hi3G, Telenor and Telia operators as of January 21, 2013. The Italian telecommunications regulator AGCOM has completed the regulation on IP Interconnection on 2011 and the Ministry of Economic Development have developed technical standards by 2012. Telecom Italia has issued Reference offer 2013 for IP Interconnection on October 31, 2012 and Manual Procedure for IP Interconnection. Telecom Italia based on 16 VoIP gateways owned will have 2 PoI and price regulation for TDM interconnection is only set until mid- 2015. The strategy undertaken by Norwegian regulator is Telenor publishes plans to offer IP interconnection for voice service in 2012 coupled with the implementation of SIP protocol, termination of PSTN. In America, IP interconnection is left entirely to operators, until 2015 there is no IP interconnection standard. AT & T and Verizon announced in 2014 that they will provide direct VOLTE services by 2015. In general, IP-based interconnection regulation is gradual with SIP implementation and termination of 2G services.

IP interconnection study development experience in some countries can be used by Indonesian regulators to anticipate IP interconnection that encourages the growth of telecommunication by paying attention to operator's capability. Currently in Indonesia, the interconnection regulated in PM 8/2006 is regulating the linkages between telecommunication network providers for voice and SMS services, and does not involve online or OTT services. With a fee-based calculation mechanism for wholesale interconnection among time-based telecom providers for voice and SMS.

### 3. Migration Strategy Toward IP Interconnection

Implementation of IP interconnection can have an impact on the industry and operators who do so, to POC changes and interconnection tariffs. Technically, the interconnection POC changes do not change the existing network configuration, so the cost based is considered fixed, but the business has a significant impact because operators who previously received local interconnection charges will be transformed into long distance interconnection charges. To overcome this, Indonesia may be able to look to the policy of India that is waiting until the entire network ecosystem and telecommunication users are already in the IP network both in terms of network elements (devices) and user devices that must have supported full IP. To overcome the differences in technology, especially the use of codecs and signaling between two operators that interconnect, the interconnect method using the hubbing / IPX concept is the most effective way. Because of this hubbing / IPX operator that will bridge and find solutions, so that operators can focus on developing their own network without being affected by other network operators who do interconnection.

Migration to IP interconnection needs to be done gradually and there needs to be a mapping of the conditions that will occur in the IP era from business, economic and regulatory factors going forward. Interconnection in the IP era ahead as the previous analysis will be divided into 3 interconnections between telecommunication network, network connection and telecommunication service. As previously mentioned in the interconnection between telecommunication networks in Indonesia, the main constraint on interconnection in the IP network is the interworking difficulties between telecommunication network providers due to the nonconformity of the device configuration standards in terms of audio video codecs, as well as the standard signaling that makes telecommunication operators unable to interconnect nicely. If the IP interconnection is to be pushed, then the first thing to do is to allow interworking between these operators, or by implementing a network translator as a device that can bridge the architectural differences and device configurations used between operators. To encourage the development of IP interconnection, the network translator can be built in 2 (two) ways, i.e.:

#### A. Development of IPX Interconnection Hub

Development of IPX-based interconnection hub is one of the most efficient ways to implement IP interconnection, this interconnection hub will be the network translator for every telecommunication provider that has different device configurations. The interconnection hub serves to translate the software configuration differences (codecs, signaling) that each telecommunications operator has. The interconnection subsystem has a cheaper advantage in implementing it while the disadvantages are needing a new license for implementation.

#### B. Implementation of IMS

IMS has the ability to network translation either between TDM-IP and inter-IP, including for IP-based interconnects. The advantage of IMS is that operators have the freedom to self-regulate, while the weakness of investment is more expensive. Table 1 shows a roadmap to IP-based interconnection from current conditions, transitions, to full IP.

### 4. Recommended Interconnection Regulatory Framework

Based on the results of the deep interview with stakeholders and considering the roadmap towards IP interconnection, the proposed regulatory framework should be included in IP interconnection regulation in the future as shown in Table 2.

**Table 1.** Roadmap Toward IP Interconnection

		Existing TDM (Network- Network)	Transition (2017-2021) (Network- Network)	Interconnection at Broadband Era (2021)		
				Network Network (Interconnection)	Network-App (Connection)	App-App (Compatibility)
Technical	Signaling	SS7	SS7, SIP	SIP		
	PoI & PoC	PoI < PoC	PoI ≤ PoC	PoI = PoC	No PoI & PoC	No PoI & PoC
	Tariff formula	Cost based	Volume based	Cost based	Revenue Sharing (B2B)	-
	Scheme	Direct, Transit	Direct, Transit	Direct, Hub	Direct, Hub	Direct, Hub

	QoS	QoS assurance	QoS assurance	QoS assurance	- QoS assurance (B2B) - Best effort (B2C)	Best effort
Business	Services Charging	Voice, SMS Time based for voice and SMS	Voice, SMS Time based for voice and SMS	Voice, SMS, Data (Audio, Video, Multimedia) Time, capacity, Volume, QoS	capacity, Volume, QoS	capacity, Volume, QoS
	Interconnection mode Costing	Termination based CPNP	Termination based, Transit CPNP	Termination based, Hub CPNP	Peering B2B	Peering B2B
Regulation	Tariff	Regulated Wholesale	Regulated Wholesale	Regulated Wholesale	Unregulated	Unregulated
	PoI	B2B	B2B	B2B	Unregulated	unregulated
	PoC	Industry self regulated	Industry self regulated	Industry self regulated	Unregulated	Unregulated
	Costing	Cost Based	Cost Based	Cost Based	B2B	B2B
	QoS Assurance (Information, Security, Safety)	Regulated	Regulated	Regulated	B2B Regulated	B2B Regulated

**Table 2.** Recommended IP Interconnection Regulatory Framework

<b>Regulation Aspects</b>	<b>Existing</b>	<b>Best Practice</b>	<b>Interconnection Regulatory Framework</b>
<b>Services</b>	voice and sms	<ul style="list-style-type: none"> <li>- Some countries start to implement IP interconnection for voice and SMS</li> <li>- No countries has interconnection between network and application</li> </ul>	<ul style="list-style-type: none"> <li>- Government prepares regulatory plans for Interconnection of voice and SMS services on IP-based networks that use managed networks</li> <li>- For interconnection at the application level, regulators need not strictly regulate because application level interconnection occurs at best effort network</li> </ul>
<b>Tariff</b>	- Time based for voice, and SMS	<ul style="list-style-type: none"> <li>- Capacity based</li> <li>- Portugal has implemented capacity based charging for IP interconnection</li> </ul>	<ul style="list-style-type: none"> <li>- Broadband voice and SMS services are calculated based on capacity formulation (service quality), but for ease of implementation to customers, fixed voice service rates in minutes, as well as fixed SMS in SMS units.</li> <li>- This tariff will rely heavily on the regulatory policy to regulate the service quality-based tariffs in the IP era</li> </ul>
<b>Network Interconnection schemes</b>	Interconnection among network providers is strictly regulated because the interconnected service is a service	Some countries still strictly regulate interconnection for voice and SMS services	Interconnection between telecommunication networks is a technical aspect that must be strictly regulated considering the need for protection to users regarding

<b>Content interconnection schemes</b>	with regulated quality standards The rapid development of OTT content causes operators to become like "dump pipe" where the absence of cooperation causes operators to not have a strong bargaining position against OTT	- Other countries are still conducting studies for the implementation of OTT - The EU is stricter regulation to the OTT, while the US implements more loose regulations - The interconnection between content providers and network providers is not clearly regulated because of different levels of interconnection, the content interconnects in the application area, while the network interconnects in the area of network devices	the quality of services that must be guaranteed. - The connection between network providers and content providers need not be rigidly regulated due to the very rapid development of OTT content - Required environments / ecosystems that further support the growth of local content, and strengthen the bargaining position of Indonesian telco operators against foreign OTT
<b>QoS</b>	Quality assurance services play an important role in the process of interconnection migration from TDM to IP and IP interconnection to IP, because both use different technologies, so the two networks cannot be directly related to each other. This is due to differences in signaling and transport media technology.	Some studies that have been undertaken by some forums and standards bodies recommend certain service quality standards that operators of IP network interconnection providers must meet	In terms of service quality assurance in the implementation of network interconnection, the standardization and government bodies develop Service Level Agreement policies for voice, data, and video services acceptable to IP network customers.

## 5. Conclusion

Evaluation of interconnection conditions among operators in Indonesia has been conducted. By conducting a deep interview with stakeholders and taking into account the infrastructure roadmap, IP-based interconnection regulatory framework for the future is proposed. In order to move towards IP-based interconnection, IP regulation awaits the readiness of operators to deploy IMS networks. To overcome the difficulties of using codecs and signaling among operators in interconnect, hubbing / IPX concept is used. The results of deep interview with stakeholders are obtained by the concept of regulation on interconnection between networks will remain strictly regulated by considering the quality of service, user protection, and business model that occurs between network providers; while for interconnection with the application will be regulated more loose (loose regulation) but still prioritize protection to the user especially protection of user information.

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### References

- [1] Law no. 36 of 1999 on Telecommunications
- [2] ..... “Ministry of communication and informatics Number 08/PER/MKOMINFO/02/2006 consider “Interconnection” Jakarta, 2006 (in Bahasa)
- [3] Kemkominfo. “Study Group of Development of Informatics and Communication Technology Regulatory”, Jakarta, 2012
- [4] Learnmarketing.(n.d.).<http://www.learnmarketing.net/Gapanalysis.html>. Retrieved 05 20, 2016 accessed on 8 September 2016
- [5] U.C. Meena, R. S. (2014). Study Paper on Interconnect Issues of IP Networks. Telecom Engineering Center, Department of Telecommunications. Government of India
- [6] WIK Consult. (2014). All-IP and The Implication for Voice Regulation
- [7] ITU-T Workshop on NGN (jointly organized with IETF). 1-2 May 2005. Basic NGN Architecture Principles & Issues. Geneva
- [8] WIK Consult. (2008). The regulation of Voice over IP in Europe: Impacts of regulation on VoIP service providers and markets”, accessed <http://docplayer.net/1012254-The-regulation-of-voice-over-ip-in-europe-impacts-of-regulation-on-voip-service-providers-and-markets.html> accessed on 8 September 2016
- [9] FTI Consulting. (2015). IP Interconnection - Market Developments. accessed <https://www.itu.int/en/ITU-D/Regional-Presence/ArabStates/Documents/events/2015/NPAP/Presentations/Market%20Developments%20WORKING%20DRAFT%20FOR%20INTERPRETERS.pdf> accessed on 10 October 2016]
- [10] FTI Consulting. (2014). IP Interconnection - Pricing and Costing. accessed <https://www.itu.int/en/ITU-D/Regional-Presence/ArabStates/Documents/events/2015/NPAP/Presentations/Charges%20and%20costs%20WORKING%20DRAFT%20FOR%20INTERPRETERS.pdf> accessed on 10 October 2016
- [11] Indonesia Broadband Plan 2014-2019 accessed via [https://ppidkemkominfo.files.wordpress.com/2014/12/rencana\\_pitalebar\\_indonesia\\_2014-2019.pdf](https://ppidkemkominfo.files.wordpress.com/2014/12/rencana_pitalebar_indonesia_2014-2019.pdf) accessed on 25 Oktober 2016
- [12] Consultation Paper on Migration to IP Based Network, India 2014
- [13] GSMA Intelligence: Analysis: Building the case for an IP- communications future, Feb 2015
- [14] MASTEL, Team Working Group Interconnection, “Draft Working Paper Development of Interconnection Regulation at Convergency era”. Jakarta: MASTEL, 2011