Colaboration Satellite Deployment Model in Indonesia

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1. Introduction

Satellite systems continue to play an important role in Indonesia, driving up demand for broadcasting services and telecommunications services. As an archipelagic country with approximately 17,508 islands, Indonesia needs to connect unserved areas with telecommunications services. The satellite capacity shortage is currently fulfilled by leasing foreign satellite capacity. Today, there are 36 foreign satellites from 16 countries that already have reciprocity agreements with Indonesia [1], and it will increase in the future if there are no new policies in the satellite deployment program. If compared with cellular systems, deployment could be done in stages, but satellite deployment will use a high upfront cost that has to be met immediately. Consequently, a higher capex is needed to deploy satellites. Satellite deployment is unique because it is uncertain until there is an orbital slot and frequency spectrum [2]. Technical aspects, economic aspects, international regulations, and sometimes political aspects should be considered in satellite deployment [3]. In fact, substituting a satellite request to ITU does not always guarantee an actual satellite because of the uncertainties such as the difficulty of getting a complete coordination status with all satellite operators with orbit slots near Indonesia's orbit slot position. The complexity of this process could increase speculation and cost. This speculation is commonly known as paper satellites [4].

The global income from the operation of satellite systems in 2009 came to about US$93 billion [5]. Today, there are about 300 commercial satellites in the geostationary-satellite orbit alone [6]. Public spending for space programs at the global level remained robust in 2007 following the sustained budgetary allocation to the US and European space budgets as well as the continued growth in space expenditures by various space agencies in Asia and Russia [7].

Indonesia has a potentially strong e-commerce industry. Based on an Ernst & Young data analysis, the growth of online sales increases 40% annually. There are 93.4 million Internet users, and there are 71 million smart phone users in Indonesia [8]. The telecommunications infrastructure, including satellite capacity, is as an enabler of the e-commerce industry. Therefore, the government should have a better solution related to an increase in satellite capacity in Indonesia. The Internet is primarily used for searching for information and chatting; it will shift to e-commerce as a lifestyle. There are tens of millions of middle class citizens in Indonesia as the target of the e-commerce industry. That is the reason why e-commerce will continue to increase. By the end of 2014, the value of the e-commerce industry in Indonesia was US$12 billion [9]. In supporting Indonesia's digital economy, the infrastructure of information networks should be built and deployed, because it has a bigger capacity and high speed for all of the Indonesian regions from Sabang to Merauke. Satellites are the most suitable infrastructure that can reach the whole Indonesian archipelago that is separated by such natural obstacles as islands, mountains, seas, and rivers. Deploying satellites is easier.

Once a satellite is already in an orbital position, it will deliver information to the users. Today, satellite technology has a bigger capacity than before. Bigger satellite capacity was already used by an Indonesian satellite operator, BRISsat. It has almost 4 GBps, launched in 2016. This capacity is almost equal to those of the Telkom 1 satellite, Telkom 2 satellite, and Palapa D satellite [10]. Telkom already launched a new Telkom 3S satellite as a replacement for the Telkom 3 satellite that had already failed during a launch in 2012 [11]. The Telkom 4 satellite is planned to be launched in 2018. This satellite, which has a bigger capacity, is known as a High Throughput Satellite (HTS). This type of satellite should be deployed more in Indonesia to fulfill the shortage of satellite capacity and to decrease the foreign satellite capacity. Deployment of this type of satellite will make Indonesia as the biggest digital economy in Southeast Asia. It is time to return to the successful era in the early 1980s when Indonesia was a pioneer country in Southeast Asia which used satellite technology. The government should submit some new satellite filing requests and orbital slots to ITU or make a new satellite deployment model.

As a function of the telecommunications administration, the Ministry of Information and Communications Technology could directly support the deployment of the satellite program. The government budget could be used for satellite filing and launching. This research will study the government's role in satellite deployment.

2. Satellite Deployment Model

The satellite deployment scheme in general can be seen in Figure1 below [12]. Satellite deployment is done clearly and accurately, considering the technical and economic aspects. Once a satellite is launched with a business plan, it is difficult to be changed again because it will influence its satellite performance that will be launched. At the business plan stage and in the technical parameters signed stage, it needs a vision for what purposes the satellite will be used. The satellite operator will consider the satellite potential of usage when it is launched. From the potential point of view, technical parameters and technical plans of the satellite will be designed into the satellite filing. Satellite filing consists of an information service that should be delivered to the user, the coverage area, the usage of frequency, the orbital slot, and other technical information. The satellite design that is stated in the filing is based on public resource information obtained by the satellite operator such as the market potential and satellite technology trend. Based on the data, the satellite operator begins to make a basic satellite design which consists of a beam and a satellite price estimation. Then it will get the value of the satellite deployment.

SATELLITE DEPLOYMENT SCHEME

Fig. 1 is a general satellite business cycle. It fills the function as a "row material" in the satellite business. Based on this row material, the services will be set for the user by the operator.

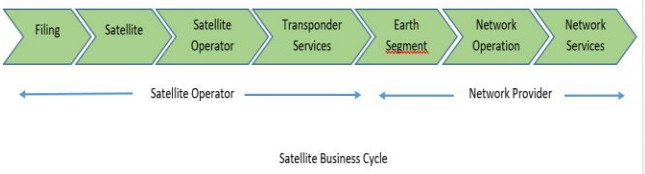
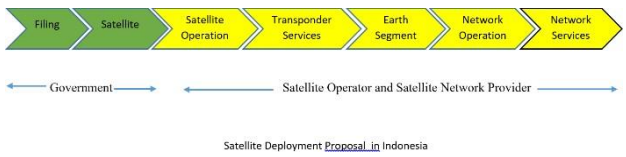


Fig. 1: Satellite Business Cycle

When a satellite business is made, the satellite operator has a filing plan consisting of technical information. The filing process and filing submitted to ITU should follow the procedures [13]. This section will be explored in another study. Once the satellite operators completely follow the ITU procedures, the satellite operator launches its satellite into the orbital slot. When the satellite is successfully launched, it starts doing a business. In some cases, there are

already some demands from a satellite operator, even if the satellite is in the launching stage. Indonesia had a satellite failure when it launched Telkom 3 in 2012 [14]. A satellite failure will have a long impact on the regulatory and satellite business itself. It took 5 years when Telkom 3 was replaced with Telkom 3S, which was recently launched in February 2017 [15]. Satellite deployment could be done by one operator, but it also could be done by some operators with many kinds of schemes such as condosat [16] and hosted payload [17]. Most satellite deployment is done by the operator. The condosat scheme is a satellite deployment model with one satellite which uses two different filings such as Media Citra Indostar (MCI), of an Indonesia satellite operator with a Luxemburg satellite operator, SES, where MCI has an S-Band filing, and SES has a Ku-Band filing at the 108.2 orbital slot [18]. Another satellite deployment scheme is hosted payload. Hosted payload is a satellite deployment scheme by placing a satellite payload on one satellite. The laid payload is usually smaller than a main payload. This scheme was previously done by the Indonesian Aeronautical and Space Agency (LAPAN) with the Indian government. If a satellite operator has only one satellite, it tends to be inefficient. Satellite control could be handled by a third party which has more satellites, so that it will optimize ground control, site location, base band components, and control applications. The satellite operator leases its transponder to the network provider and broadcasting content provider too. A transponder business deal is done by leasing bandwidth retail in a short and medium term for 1-5 years, and long term (usually 15 years). The satellite operator has a transponder and leases it to a network provider such as a VSAT provider or an Internet service provider. From the general satellite business cycle point of view, it seems that the satellite operator role is very dominant because it controls the business cycle from "upstream to downstream". This business process has a high risk, and it needs high capex too. Some Indonesian satellite operators, and telecommunications network providers who have satellite filings, face financial difficulties in how to materialize a satellite filing to become a real satellite [19]. Mostly, Indonesian satellite operators have one satellite only except for Telkom. Having limited financial resources is the main problem with those satellite operators that have only one satellite in their operation, as well as the availability of orbital slot and frequency [20]. In the general business cycle, the government's role is focused on the regulatory side, and it encourages the satellite operator in order to materialize those satellite filings that have to become real satellites. When a satellite operator faces a problem about how to make a filing turn into a real satellite due to some internal and external factors, in the end the filing will pass a 7-year regulatory period, and finally it will be suppressed by ITU [21]. A lost filing is the impact of a filing suppression, while the total cost during the coordination process and cost recovery is the responsibility of the operator. A filing suppression can happen to any satellite operator. To share the risks in satellite deployment, this study proposes a new scheme and empowerment of the government's role through financially supporting the satellite design until the satellite is launched. The proposal can be seen in Fig. 2.

Satellite Deployment Proposal in Indonesia



Satellite Deployment Proposal in Indonesia

Fig. 2: Satellite Deployment Proposal in Indonesia

Satellite deployment needs high capex, and it has a high risk too. Currently, Indonesia has 5 satellite operators, which are: Telkom, Indosat, PSN, BRIsat, and MCI, where most of them have only one satellite except Telkom, which has 3 satellites. Indonesia also has 2 candidate satellite operators, which have satellite filings; these are CSM and SMA. When CSM and SMA complete satellite coordination and follow ITU regulations, Indonesia will have 7 satellite operators [22]. Based on interviews conducted in the study, compared to ASEAN countries such as Malaysia, Thailand, Vietnam, and Singapore, it is important for Indonesia to review its satellite policies and regulations in supporting satellite deployment. There are too many satellite operators, so they need to be consolidated. Having a wide coverage area is the main characteristic of the satellite industry. This condition will make operators compete tightly in Indonesia's satellite market. Another problem is the complexity during the satellite coordination process among Indonesian satellite operators, for example, when one operator or more is part of a foreign satellite or an affiliation of foreign satellites with different countries. PSN is one of 5 Indonesian network providers which partake as satellite operators, while Telkom and Indosat are telecommunications companies, MCI is a broadcasting satellite service, and BRIsat is a banking institution. Most of the satellite operators in ASEAN are focused on being satellite operators, such as Measat of Malaysia, Thaicom of Thailand, and Vinasat of Vietnam. Likewise, this is the case with other countries such as Apstar of China, Asiasat of China, Chinasat of China, JCSAT of Japan, Intelsat of the USA, and Inmarsat of the UK. At first, Indonesia had one satellite operator, which is known as PSN. Unfortunately, PSN does not have a significant number of satellites [23].

This research proposes satellite deployment in Indonesia as seen in Fig. 2. The government will provide capex for satellite filings until satellite launches. Once a satellite is successfully launched and stays in the orbital slot, the satellite will operate normally. The government then conducts an operator selection. The eligible operators will undergo the selection process, in which the winner will get the highest price of the satellite. The capex of the satellite deployment is obtained from some resources such as the state budget, USO program, and Indonesian infrastructure guarantor. Once capex as the government portion exists, it will be fully recovered from the profit of the winner. If the selection has no winner, the government will appoint it to a state enterprise or a new government entity.

3. Discussion

One of the criteria for making decisions on the advisability of investing in a commercial project is the net present value (NPV) evaluation. The basic idea is that it is worth investing in a project when the net present value of anticipated future cash flowing from the investment is greater than the expenditure. It can be expressed in general terms as follows:

$$NPVop\ (n) = -C \sum_{K=1}^{n} \frac{Pk}{(1+R)^k}$$

n = satellite life time

C = satellite price

Pk = net profit

= operator income (n) – operator expense (n)

= (income of transponder services (n)) – (cost of power (n) + ground control maintenance (n) + transponder manage cost (n) + customer relation cost (n) +

satellite coordination cost (n) + filing cost recovery (n) + human resources cost (n))

R = central bank rate

K = 1…..n

$$NPVgov\ (t) = -C \sum_{K=0}^{t} \frac{Pk}{(1+R)^k}$$

Pk = net profit

= government income (t) – government expenses (t)

= satellite price – (opex when the satellite is launched but no one leases the transponder (t))

= satellite price – {ground control leased (t) + human resources (t) + power (t)}

C = government capex until the satellite launch

= spacecraft + launcher + ground control + monitoring consultant + consultant of new satellite

t = time satellite was launched until satellite sold

R = central bank rate

Based on the explanation above, if the value of NPV ≤ 0, investing in the project is considered to be economically inefficient, but if NPV ≥ 0, investing in the project is considered to be economically efficient.

4. Conclusions and Proposal

Indonesia will continue to use satellite services. Satellite services will increase along with cellular technology growth such as 4G. Today, Indonesia is in the 4G cellular era, which requires more bandwidth. Government programs in the telecommunications sphere will support economic activities such as e-commerce. A telecommunications system should support the backbone, back haul, and last mile. In this case, the role of a satellite is very important. Satellites are suitable with Indonesia's condition. In line with the role of satellites, the government should provide a transponder capacity in Indonesia, which should decrease foreign satellite usage. Based on an economic approach and due to limited natural resources such as an orbital slot and spectrum, it is important to implement an economic method in managing satellite filing. Adopting an economic method in selecting a satellite operator will have a positive impact of telecommunications services on users. The Indonesian government will provide a budget, starting from the satellite design until satellite launching. Once the satellite is in the orbital slot, the cost which has already been spent by the government will be paid up from the price of the winner in the selection process. The satellite operator can make a consortium or collaboration with foreign satellite operators. The satellite budgeting mechanism is called a government bailout mechanism. The government can make a special entity to manage the budgeting or utilize an existing entity. The orbital satellite that will be selected could be an Indonesian planned band, and it will be managed by a government entity or another satellite filing entity.

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