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The Model of Information Technology Utilization in Rural Areas of Indonesia Based on 4G LTE

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ABSTRACT

4G-LTE has become game changer in the GSM era especially in a developing country which has limited connectivity to the internet world. Having this limited capability, several rural areas in Indonesia has been suffered of its internet connection need. They need to visit nearest city just to used better internet connection. Facing industry 4.0 era, it is normal to have internet connection everywhere that supports industrial activities from all levels ranging from home industry to heavy industry, to win the competitive market. The people should get sufficient internet connection to support their daily activity. Nowadays, with COVID-19 pandemic has transformed all human being to adapt this fast-growing technology, just to survive from the pandemic. What was on site activity now has become remotely conducted activity (mostly using internet connection). 4G-LTE technology that is widely available for telecommunication in Indonesia, should also adopted to support daily activity during and beyond pandemic situation. This study employs common telecommunication devices combined with networking devices targeted to achieve the same utilization of the devices when implemented in most common places like offices in major cities, that in the end brings internet connection to places where usually no internet connection or blank spots occurred in rural areas.

Keywords: 4G-LTE, Communication, Infrastructure, Internet

JEL Classification: M10, M15, M19

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INTRODUCTION

The communication and information technology are not equally available throughout Indonesia region, especially in rural areas in which lack of sufficient internet connection. Such condition is contrastly visible to major cities where blank spots are rarely found. People in rural areas are struggle to get reasonable or fair internet connection to support their daily activities, they even need to travel to downtown just to get internet services. The challenges of industry 4.0 era are rises due to the nature of connectivity. Internet connection plays an important role in connectivity, ranging from home industry up to major manufacturing industry depends on internet to run their day-to-day activities. IT has become primary boost for every industry, from manufacturing to education, it can speedup activities in each area. Business which avoids IT are easily withdrawn from the market.

The global Covid-19 pandemic have pushed everybody to enter the online community whether they like it or not, to avoid direct meeting that may spread Covid-19 virus. The internet connection has become primary need for people to do their daily routines, either for work or business and also school. The cellular based internet connection (using 4G-LTE connection) has given every body access to internet almost all across areas in Indonesia, whereas fix line internet infrastructure has not.

The internet 1.0 era has evolved rapidly to spread information. Not only for adults, children are also using internet to support their activities. The Internet 2.0 are now something common. The following graph has shown the increase of internet usage in Indonesia during 1998 to 2017 period.

Figure 1. Indonesia Internet Usage

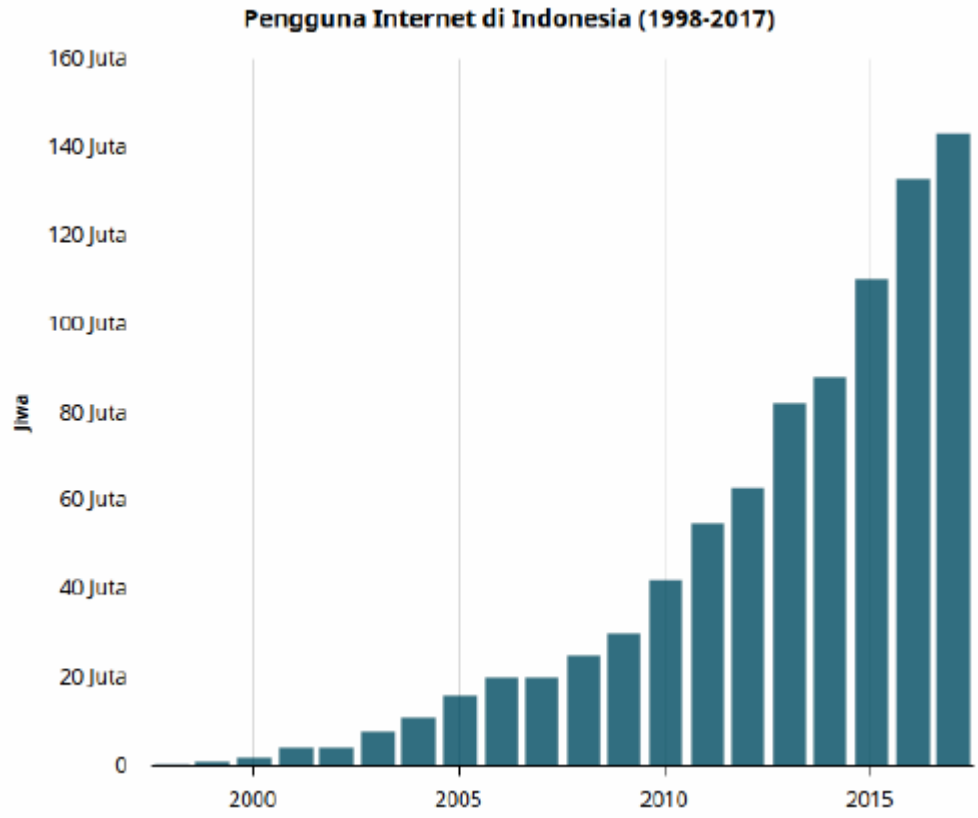


Figure 1 has shown the massive internet usage in Indonesia (Haryanto, 2020), and as APJII survey results in 2018 shown that internet usage penetration in Indonesia has reach at least 64.8% (Annur, 2019), which also means that internet connection has

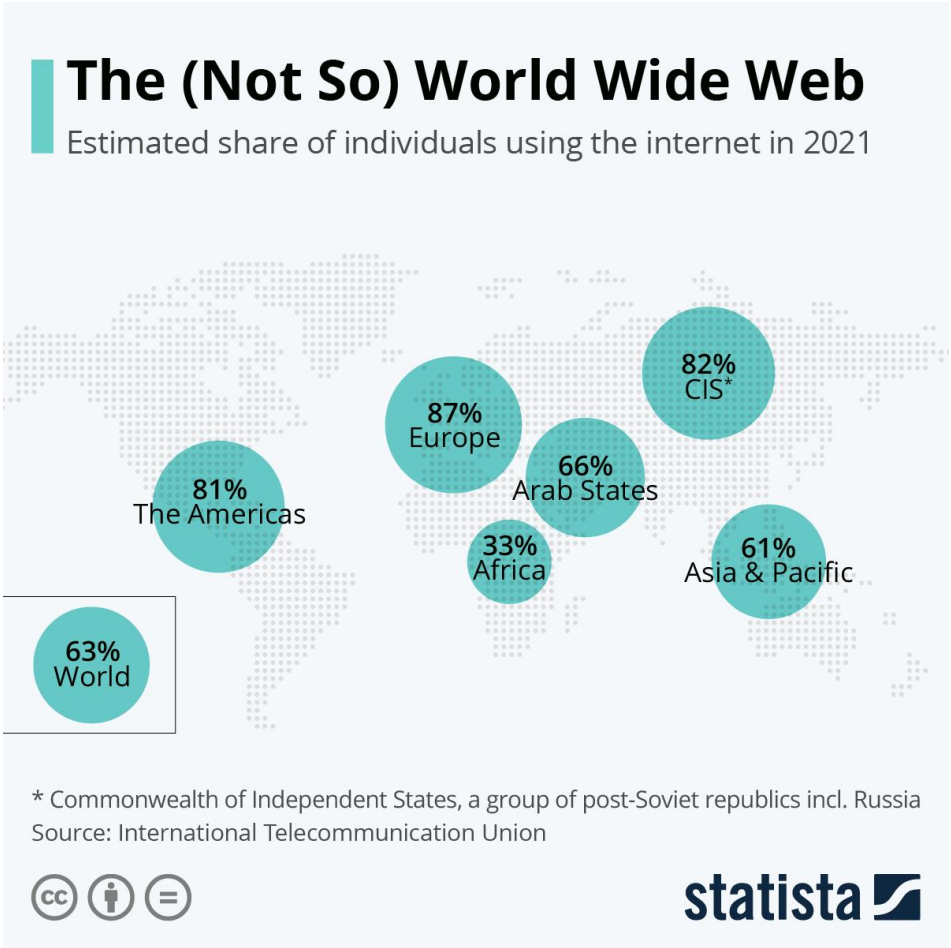
potential benefits to support daily activities either for business or entertainments. The cellular based internet connection using 4G-LTE technology is capable of delivering speed up to 10 times faster than its predecessor 2G and 3G connection (Gemiharto, 2015) that automatically has transformed almost every one activity. This is good for some rural areas that was not covered by traditional infrastructure, but also brings challenges because of this technology adoption (Colom, 2020).

LITERATURE REVIEW

The internetworking (Internet)

Set of computers that are connected physically that enable resource sharing, has grown significantly since it was introduced in late 1960 (Galloway, n.d.; Jacksi & Abass, 2019). From military to publicly worldwide implemented project, this technology has massively transformed human life's, from businesses to leisure activities all have changed by internet. As of 2021, internet penetration has reached almost all major continents except Africa that only 33% of their population accessing the internet, or 63% of earth population has connected to the internet (Richter, n.d.).

Figure 2. Internet Penetration Worldwide



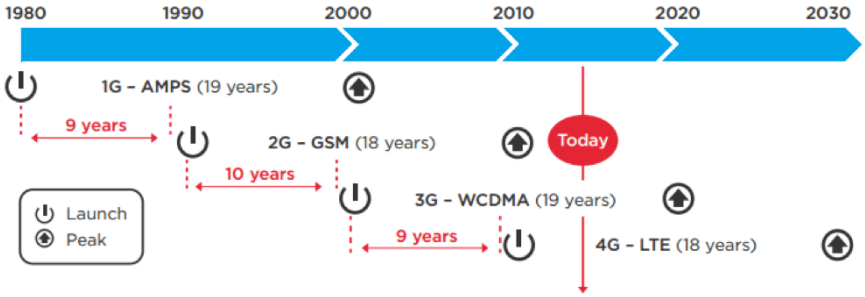
source : International Telecommunication Union

Cellular Technology

The Nippon Telegraph and Telephone (NTT) was introducing the first cellular phone for public services in 1979 known as the 1G or first-generation cellular services all across Japan, although the prototype of a cellular phone was made in 1973 (Galazzo, 2021).

The celluler technology by 2020 has increased significantly bringing internet access also available using cellular devices (Hidayat et al., 2020). With 4G cellular technology, the speed of internet connection has nearly adequate as traditional connection by cables (Almazroi, 2018; Kumaravel, 2011). From the first public introduction up to now, the cellular technology has evolved significantly, noteably it's data transfer capability.

Figure 3. Cellular Evolution



source: (*The Past, Present, and Future of LTE: The Long Road to 5G*, n.d.)

Internet Hotspot
Internet connection sharing is commonly available in offices in major cities. To share a single internet connection, one needs a device capable of sharing a single internet connection to multiple devices as if each device has a dedicated internet connection. RouterOS is one publicly known well perform router operating system that powers widely used routers in Indonesia. In most cases, we can customize configuration based on our needs so that the router will fits in much more situations (Kuspandi Putra et al., 2020; *Mikrotik.ID: Unjuk Gigi Router Rakitan*, n.d.).

The internet bandwidth is most concern factor when using mobile internet access using 4G-LTE connection. Every bit in and out for any devices connected to network need to be regulated accordingly so that they can access the internet as effective as possible. Internet hotspot implementation is one method to save available bandwidth. Using hotspot, users are regulated either using timely manner, bytes calculation or daily quotas (Romadon, 2020; Suryanto & Permadi, 2020). The internet hotspot implementation helps to maximize the limited internet quotas accordingly.

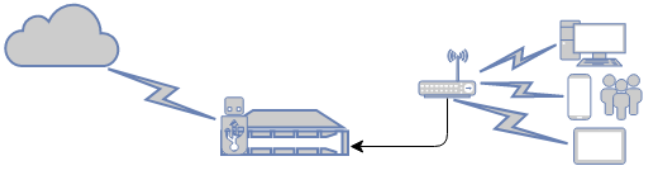
RESEARCH METHOD

This study achieved by conducting literature reviews that mostly surveys of scholarly articles, books, and other related materials that support the idea of the study (Nakano & Muniz Jr., 2018; Ramdhani et al., 2014). In the end of this study, authors will introduce the utilization model of information technology that suit to certain location in Indonesia's rural areas that could then widely adapted at similar location elsewhere. The locus of this research is Oebelo village, Kupang district, East Nusa Tenggara province, where internet infrastructure is less available in compare to the city of Kupang.

RESULTS AND DISCUSSION

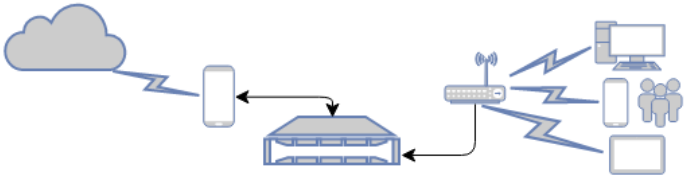
Proposed Models
We have three models tested with each of test scenario described as follows.
The first models used USB 4G Modem as a main link to the internet. Every request is handled by Mikrotik router, and send the traffics through this USB modem.

Figure 4. Model 1 – Internet connection by USB 4G modem



This scenario works in most major cities in Indonesia, where telecommunication infrastructure is mature and available. The drawbacks of this model is the fact that not all areas in Indonesia, especially in rural areas are capable of implemented since no signal captured by USB 4G modem.

Figure 5. Model 2 – Internet connection using 4G cellular phone



The second scenario is using a regular 4G cellular phone as replacement of the USB 4G modem. The drawback of this model is cellular phone used not designed to be powered by power adaptor all the time since it will destroy the charging circuit easily.

Figure 6. Model 3 – Internet connection using CPE 4G Wi-Fi router

The third scenario tested is using CPE 4G LTE router. This model works suitable since the hardware used by CPE router is designed to be powered by an AC adaptor, hence giving most reliable hardware solution to fit the requirement.

Implemented Models
Each scenario tested both at Jakarta region and Oebelo district at Kupang, East Nusa Tenggara province. Even though those three models work well when tested at Jakarta, only two models work at the remote area. Considering long term usage of this model, the only fit model for this research is the model number 3, which employs CPE 4G LTE wifi router as a main internet solution.

Implementation Notes
The available internet connection by using 4G LTE cellular technology is considered as ‘nice-to-have’ in rural areas in Indonesia. By having these limited resources for daily teaching and learning process, it is a must that every bit delivered from the router are usefull. Therefore, to manage such a precious bandwidth needs more strategies to make sure the maximum internet connection utilization.

To maximize wireless connection to schoolwide area, two wireless outdoor CPE are set in place. Bandwidth management implemented in this research is Hotspot feature within Mikrotik RouterOS.

The bandwidth of internet connection used in the school area is 15mbps download (DL) and 8mbps upload (UL). Active computers accessing the network are around 15 laptops in teachers' room, and 20 computers in computer lab, therefore the hotspot feature settings are 8mbps/4mbps for teachers while for students in computer lab the speed is limited to 4mbps/2mbps for DL/UL. By implementing hotspot feature we can manage the available bandwidth fairly, and avoiding bandwidth misuse like downloading big files during school hours.

CONCLUSION

After testing three scenarios of information technology adoption for the school in rural areas where internet access is far beyond reach, the authors have a final and affirmative conclusion that the chosen scenario is currently appropriate at the moment. This applied scenario has an upgrade possibility in the future, especially when a reliable and stable internet connection coverage reach the area, hence some configurations are still applicable to be used now and then. By bringing internet connection to this area, hopefully the school may have more engaging daily learning activities, because learning materials are coming from multiple sources, not only from the text books.

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DECLARATION OF CONFLICTING INTERESTS

The author has no conflict of interest.

REFERENCES

Almazroi, A. A. (2018). Performance analysis of 4G broadband cellular networks. *International Journal of ADVANCED AND APPLIED SCIENCES*, *5*(9), 12–17. https://doi.org/10.21833/ijaas.2018.09.003

Annur, C. M. (2019). *Survei APJII: Penetrasi Pengguna Internet di Indonesia Capai 64,8% - Katadata.co.id*. Katadata.Co.Id. https://katadata.co.id/sortatobing/digital/5e9a51915cd3b/survei-apjii-penetrasi-pengguna-internet-di-indonesia-capai-648

Colom, A. (2020). The Digital Divide. *Information, Communication & Society*, *23*(11), 1706–1708. https://doi.org/10.1080/1369118X.2020.1781916

Galazzo, R. (2021, November 21). *Timeline from 1G to 5G: A Brief History on Cell Phones - CENGN*. https://www.cengn.ca/information-centre/innovation/timeline-from-1g-to-5g-a-brief-history-on-cell-phones/

Galloway, C. (n.d.). *History of the Internet Infographic on Behance*. Retrieved December 9, 2021, from https://www.behance.net/gallery/6310935/History-of-the-Internet-Infographic

Gemiharto, I. (2015). Teknologi 4G-Lte Dan Tantangan Konvergensi Media Di Indonesia. *Jurnal Kajian Komunikasi*, *3*(2), 212–220. https://doi.org/10.24198/jkk.vol3n2.10

Haryanto, A. T. (2020). *Riset: Ada 175,2 Juta Pengguna Internet di Indonesia*. Detikinet. https://inet.detik.com/cyberlife/d-4907674/riset-ada-1752-juta-pengguna-internet-di-indonesia

Hidayat, T., Mahardiko, R., & Alaydrus, M. (2020). Mobile cellular technology forecast for the Indonesian telecommunications industry. *Journal of Telecommunications and the Digital Economy*, *8*(1), 37–48. https://doi.org/10.18080/JTDE.V8N1.226

Jacksi, K., & Abass, S. M. (2019). Development history of the world wide web. *International Journal of Scientific and Technology Research*, *8*(9), 75–79.

Kumaravel, K. (2011). Comparative Study of 3G and 4G in Mobile Technology. *International Journal of Computer Science*, *8*(5), 256–263. www.IJCSI.org

Kuspandi Putra, Y., Sadali, M., & Mahpuz, M. (2020). Penerapan Mikrotik Dalam Mengembangkan Infrastruktur Jaringan Pada Kantor Desa Rumbuk Kecamatan Sakra. *Infotek : Jurnal Informatika Dan Teknologi*, *3*(2), 182–193. https://doi.org/10.29408/jit.v3i2.2350

Mikrotik.ID: Unjuk Gigi Router Rakitan. (n.d.). Retrieved December 9, 2021, from http://mikrotik.co.id/artikel_lihat.php?id=11

Nakano, D., & Muniz Jr., J. (2018). Writing the literature review for empirical papers. *Production*, *28*. https://doi.org/10.1590/0103-6513.20170086

Ramdhani, A., Ramdhani, M., & Amin, A. (2014). Writing a Literature Review Research Paper: A step-by-step approach. *International Journal of Basic and Applied Science*, *3*, 47–56.

Richter, F. (n.d.). • *Chart: The (Not So) World Wide Web* | *Statista*. Retrieved December 9, 2021, from https://www.statista.com/chart/3512/internet-adoption-in-2015/

Romadon, I. (2020). PENGEMBANGAN KONFIGURASI HOTSPOT DAN VOUCHER LOGIN MENGGUNAKAN MIKROTIK RB952ui DENGAN WEB TOP UP (STUDI KASUS: NORALONA COFFEE ROASTERY). *JURNAL FASILKOM*, *10*(2), 90–96. https://doi.org/10.37859/jf.v10i2.2090

Suryanto, S., & Permadi, F. A. (2020). Optimalisasi Jaringan Internet Hotspot Menggunakan User Manajemen Pada Pusat Pengembangan SDM Asuransi Indonesia. *Jurnal Infortech*, *1*(2), 59–67. https://doi.org/10.31294/infortech.v1i2.7083

The Past, Present, and Future of LTE: The Long Road to 5G. (n.d.). Retrieved December 9, 2021, from https://www.telit.com/lte-evolution-standardization-and-deployment-the-long-run-to-5g/