How the Internet Works and How it is Paid For (Part 3: Five Economic Studies in APAC)

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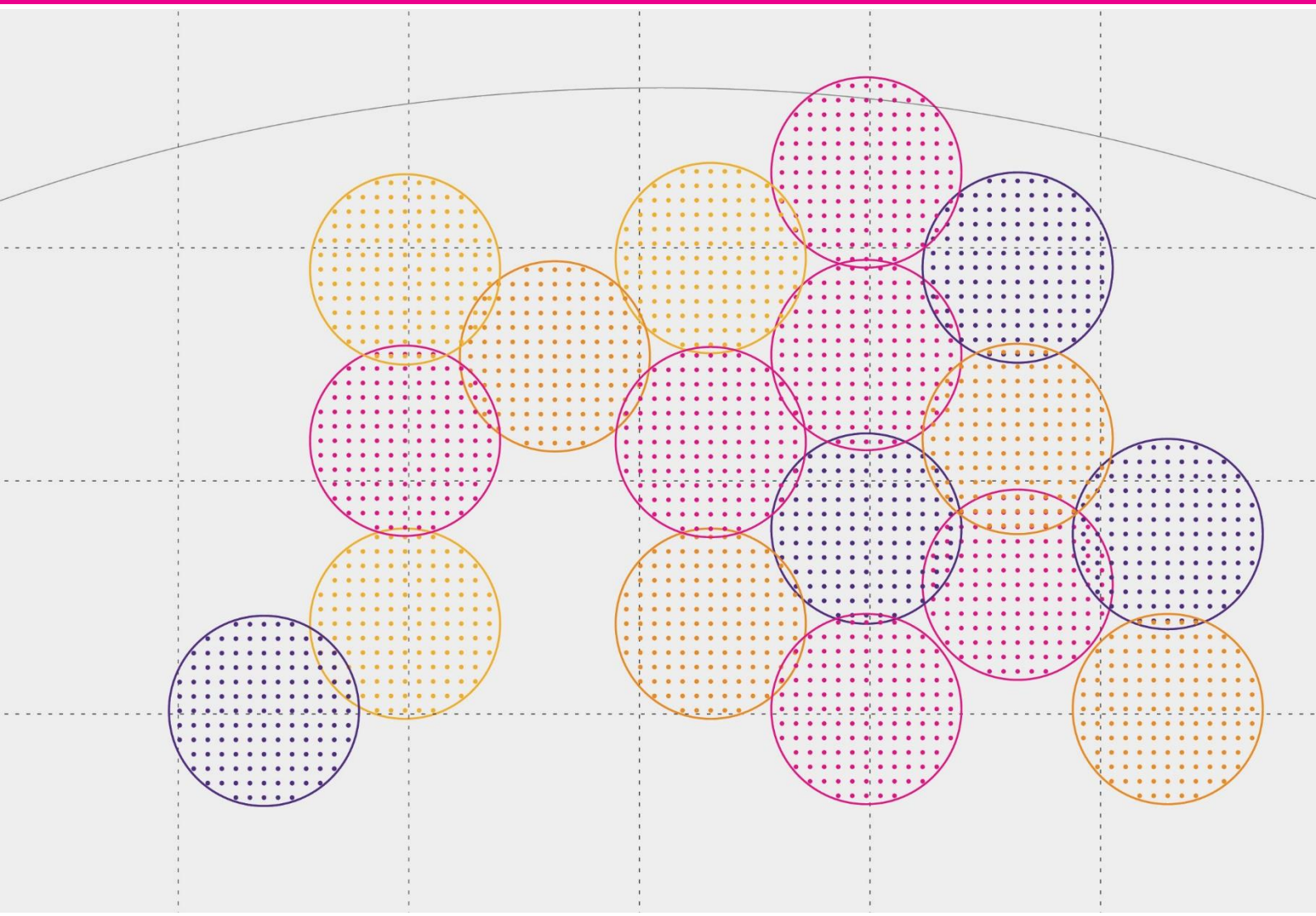

About Plum

Plum offers strategy, policy and regulatory advice on telecoms, spectrum, online and audio-visual media issues. We draw on economics and engineering, our knowledge of the sector and our clients' understanding and perspective to shape and respond to convergence.

About this study

This is a report for Google that addresses the topic: *How the Internet works (and is paid for) – a 2020s refresh* (to inform policymaking).

This is the third of three parts of the study: concentrating on the economics of the Internet in five countries in Asia Pacific (APAC).

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1 A market overview of today's Internet

Asia Pacific (APAC) countries strongly differ in their policy and regulatory approaches of the Internet. This section details the Internet market landscape as well as the regulatory landscape of five countries: Japan and Singapore appear to apply lighter regulations, whereas regulatory intervention looks stronger in South Korea, Indonesia and Australia.

It is firstly important to note that country specificities strongly vary from very urban profiles (Singapore, Japan) to rural ones (Indonesia), and from very high population density (Singapore) to low population density (Australia). Regarding the Internet market, the number of MNOs goes from 3 to 4 depending on the country; and Internet use goes from 54% of total population in Indonesia to 97% in South Korea.

1.1 Interconnection regulation

Some countries' regulators encourage improvement of interconnection, but only one applies regulatory intervention at the interconnection level.

In **South Korea**, the interconnection policy was revised in 2014 in order to change the peering model from a free one to a paying model[1], to implement the Sending Party Network Pays (SPNP) rule which charges the sending of data and to adopt a price-cap regulation. These settlements were based on the volume of traffic exchanged and have resulted in a series on non-competitive consequences.

After identifying transit pricing inefficiencies in the market due to some market power hold by the three main large operators, the **Australian** regulator has welcomed the publication of their peering criteria as having improved market information transparency.

In Singapore, IP transit and peering landscape was reviewed by the regulator a few years ago who concluded there was no need for public intervention but recommended transparency of peering policies by operators to facilitate interconnection arrangements. The regulator claims it has adopted a three-axis approach to regulation:

- "A balanced and pragmatic regulatory framework": ISP and content providers are regulated with a particular focus on content issues of concern to Singapore (public interest, race, religion and content harmful to children);
- "Encouraging industry self-regulation": the regulator encourages market players to adopt industry codes of practice; and
- Use education to "promote media literacy and cyber wellness".

1.2 Data and content

In Japan, ISPs are protected from content deletion: If an ISP reasonably believes that the content infringes the intellectual property rights or privacy of others, or if a third party alleges infringement and the content originator does not respond to the ISP's inquiry within seven days, ISPs can't be held liable for the deletion of content on their network.

[1] Since 2020, free peering is possible again under certain conditions.

Stringent regulation has been implemented in Indonesia regarding data and content. A regulation was adopted in 2012 that required all websites and applications providing online services to store data within Indonesia's territorial jurisdiction. After noting that it was largely not enforced, a 2019 follow up initiative limited the data localization mandate to those processing government data from public bodies. Still in Indonesia, a 2021 regulation on content has come into force to make operators and platforms comply with content removal orders within 24 hours (and within 4 hours for urgent requests).

1.3 Wholesale network

In Australia, discussions on the public wholesale network are taking place currently. The national wholesale network has been built and operated by the government with the objectives of promoting competition at the retail fixed broadband level and of accelerating infrastructure buildout. An initial long-term regulatory framework was established in 2013 to regulate prices and provide the NBN (National Broadband Network) an opportunity to recover its costs, while being able to innovate and invest in improved services. After ISPs have recently raised concerns about the impacts on the retail market structure and the price level of NBN and given the mixed outcome of the project, a revised regulation is expected[2].

Figure 1 compares some economic and Internet market indicators between the case study countries. Case studies have been detailed in the following sections of the report.

Figure 1: Comparative table between selected case study countries[3]

	Australia	Indonesia	Japan	Singapore	South Korea
Economic and demographic					
Population (million)	26	276.36	125.3	5.73	51.79
Population density (%)	3	146	345	8019	531
Proportion of rural population (%)	13.6	42.7	8.1	0	18.6
Market indicators					
Number of MNOs	3	4	4	4	3
Number of IXPs	83	10	38	18	14
Internet users (% total pop - 2021)	87	54	93	92	97
Average daily time spent using the Internet (2022)	6h 13min	8h 36min	4h 26 min	7h 29min	5h 29min
The inclusive Internet index (rank 2021)[4]	4th	66th	14th	12th	11th
Mobile Internet Indicators					
5G mobile broadband coverage (% population, 2021)	89.4	4.6	60.5	98	73.6
4G mobile broadband coverage (% population, 2021)	99	86	100	100	100
4G penetration (% population, 2021)	95.8	100.1	132.4	121.7	76.8

[2] https://www.accc.gov.au/media-release/key-issues-outlined-for-efficient-and-sustainable-nbn-regulation
[3] Data is from 2020 unless stated otherwise.
[4] The Inclusive Internet Index is commissioned by Facebook and conducted by The Economist Intelligence Unit. The index provides a rigorous benchmark of national-level Internet inclusion in 120 countries across four categories: Availability, Affordability, Relevance and Readiness. Available at: https://theinclusiveInternet.eiu.com/

Mobile broadband data usage per subscription (MB per month)	7959	6498	4972	5636	10386
Fixed Internet indicators					
Fixed broadband subscriptions (% pop)	35	4	34	26	44
FTTH subscriptions (% households, 2019)	18%	12%	71%	100%	93%
Fixed broadband data usage per subscription (MB per month)	245867	65978	167093	-	313589
Prices					
Mobile broadband (voice and data, high usage, current USD)	$34.21	$7.74	$50.33	$17.94	$20.55
Mobile broadband (% of monthly GNI[5])	0.8	1.3	1.2	0.4	0.4
Fixed broadband (entry level, at least 5GB, current USD)	$51.32	$34.81	$37.06	$35.81	$28.77
Fixed broadband (% of monthly GNI)	1.2	10.9	1.1	0.7	1.1
Other indicators					
Regulatory intervention at the interconnection level	×	×	×	×	√
Content regulation	√	√	×	√	×
State-owned wholesale network	√	×	×	×	×

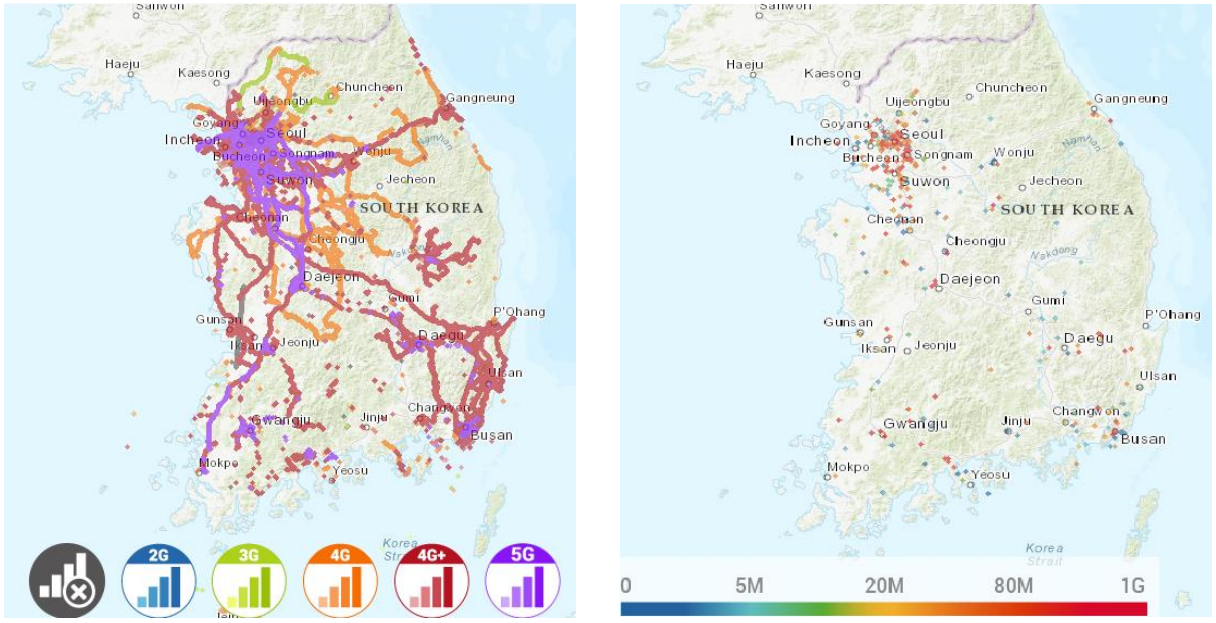
[5] Gross National Income per capita

2 South Korea

2.1 Overview of the Internet landscape

South Korea has reached universal fibre network access based on government policies focusing on expanding access to telecommunications, and this infrastructure has contributed to the country's leapfrog on 5G deployment. South Korea has been frontrunner in 5G deployment at the global level, with 12 million 5G subscribers in 2020 and a forecast penetration of 90% of population by 2026 (Figure 2.1). The rise in 5G users and traffic growth have been faster than expected. Operators have included free innovative content in their offers (Figure 2.2) which may have contributed to stimulating demand and increasing ARPUs. The ecosystem has also benefited from this new order, with the closing of new partnerships: for example, SK Telecom and Microsoft have signed an exclusive partnership in 2019 on a cloud gaming service called xCloud[6]. In order to continue to scale network capacity to customer demand, the country plans to double 5G spectrum allocation by 2026.

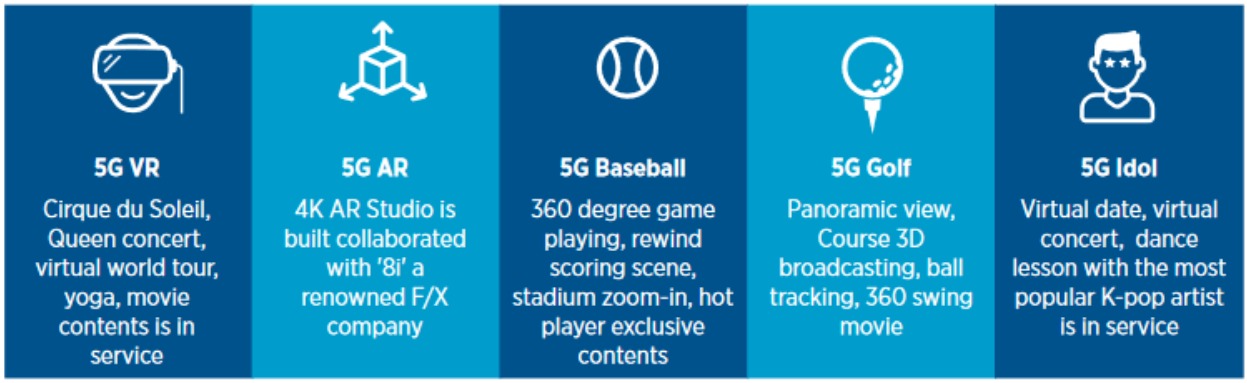
Figure 2.1: Mobile coverage and download speed in South Korea (KT)



Source: nPerf[7]

[6] https://news.microsoft.com/apac/2019/09/04/sk-telecom-and-microsoft-announce-plans-for-joint-5g-based-cloud-gaming/
[7] https://www.nperf.com/en/map/KR/-/1935.KT/signal/?ll=35.95128693544543&lg=128.005&zoom=6 (Accessed 7/3/2022)

Figure 2.2: Examples of content offered by South Korean operators



Source: GSMA[8]

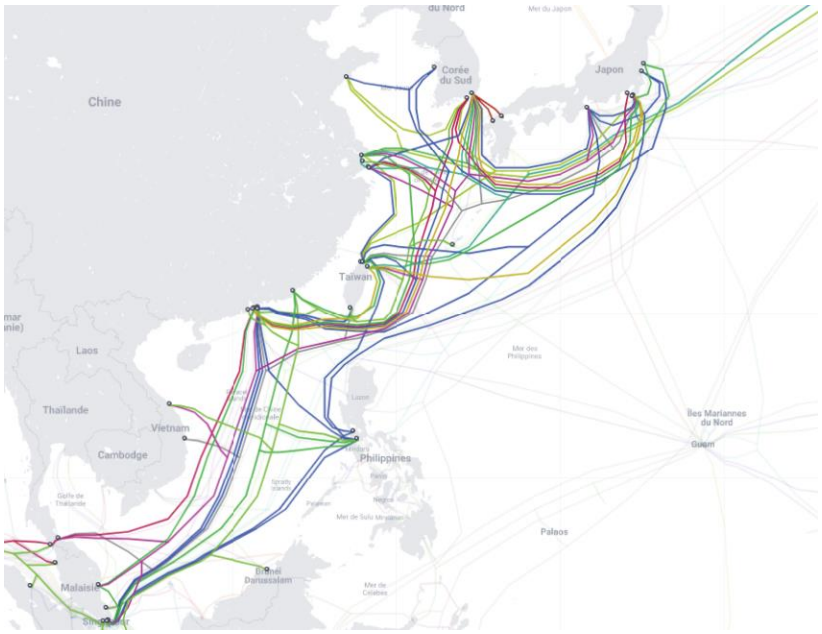
The telecommunications market in South Korea is the third largest market in the world by revenue[9] and largely dominated by three operators: SK Telecom[10] (39% market shares[11]), KT Corporation[12] (32% market shares), and LG U+[13] (29% market shares), which all provide mobile, fixed and Internet services. MVNOs also operate in the country, like S1Mobile[14] and Liiv M[15]. The affordability in the South Korea telecom market is better than in other countries in the APAC region: Average spend in mobile broadband services represent 0.4% of monthly GNI (vs. 1.2% Japan and 1.3% Indonesia). The demand market shows a higher mobile broadband data usage per subscription (10386 MB per month) than in other countries (5636 MB per month in Singapore and 4972 MB per month in Japan).

2.1.1 Submarine cables and international connectivity

Landing points of submarine cables in South Korea are in Shindu-Ri in the West, in Geoje and in Busan in the South (Figure 2.3). While eight submarine cables connect South Korea to the rest of the world, only three of them (New Cross Pacific Cable System, Asia Pacific Gateway and Trans-Pacific Express cable system) have been built in the past 15 years; a new one is under construction: SJC2 (Southeast Asia-Japan Cable 2)[16] will connect South Korea with China, Japan, Singapore, Taiwan, Thailand and Vietnam. KT has recently confirmed it will establish and operate a submarine cable in partnership with Savills, a real estate service provider[17], to connect 6 APAC countries, including South Korea, Japan, Taiwan, Indonesia, Philippines, and Singapore, in order to face the "demand derived from services such as digital transformation-based cloud services and over-the-top" which "falls upon not only South Korea, but the entire Asian region"[18].

[8] Realising 5G's full potential: setting policies for success, GSMA, March 2020
[9] https://www.prnewswire.com/news-releases/south-korea-telecoms-industry-report-2020-2025-and-the-impact-of-covid-19-301123024.html
[10] https://www.sktelecom.com/index_en.html
[11] Cellular revenue market shares, 2021, GSMA Intelligence
[12] https://www.kt.com/
[13] http://www.uplus.co.kr/home/Index.hpi
[14] http://www.s1mobile.co.kr/index.do
[15] https://www.liivm.com/
[16] https://www.submarinecablemap.com/country/south-korea
[17] http://www.koreaherald.com/view.php?ud=20220207000825
[18] https://www.ajudaily.com/view/20220207145352328

Figure 2.3: Submarine cables connecting South Korea



Source: Telegeography[19]

2.2 Overview of the regulatory context

2.2.1 Lack of intercontinental network capacity and debate on network congestion

At the international scale, the three South Korean ISPs are not considered as Tier-1 operators, so they have to pay for international transit.

The lack of intercontinental network capacity of the local ISPs has led them to a partnership with Google to adopt its CDN/cache service Google Global Cache and to deploy it in their networks of ISPs, which would theoretically bring a financial benefit for ISPs. But the apparent increase in YouTube traffic that followed, and the large share of bandwidth used, made ISPs argue that they would have made bigger profits by dealing with YouTube like with any other content provider (and not partnering with Google). ISPs in Korea claim that global content providers traffic is causing congestion in the local networks. As a result, at the time of writing, they want payment from the global networks for terminating the traffic. They have argued that 60% of their capacity was used for Netflix, YouTube and Facebook termination.

The Sending Party Network Pays rule may explain why. ISPs have begun to feel financial burden of hosting popular content. To explain more in detail, if a popular content was hosted on KT's data centres, KT would have to pay SK and LG for sending that popular content to SK and LG due to this rule. The traffic is generated because SK and LG's users requested access to the content, and this completely distorts the Internet model. On top of charging domestic content servers high access fees, ISPs demand payment for overseas content cache servers which had been solicited for free. SK Broadband made such a demand to Netflix and KT to Facebook; content providers offered to go back to the previous situation and remove the use of their cache servers, which the government objected since it would slow down user access.

[19] Telegeography Submarine Cable map. Available at: https://www.submarinecablemap.com/country/south-korea

2.2.2 Impact of the regulatory intervention at the interconnection level

The South Korea interconnection policy was revised in 2014[20] has:

- changed the peering model from a free one to a paying model[21],
- implemented the Sending Party Network Pays (SPNP) rule which charges the sending of data. The net sender network pays the net receiver network,
- adopted a price-cap regulation.

These settlements are based on the volume of traffic exchanged and result in a series on non-competitive consequences:

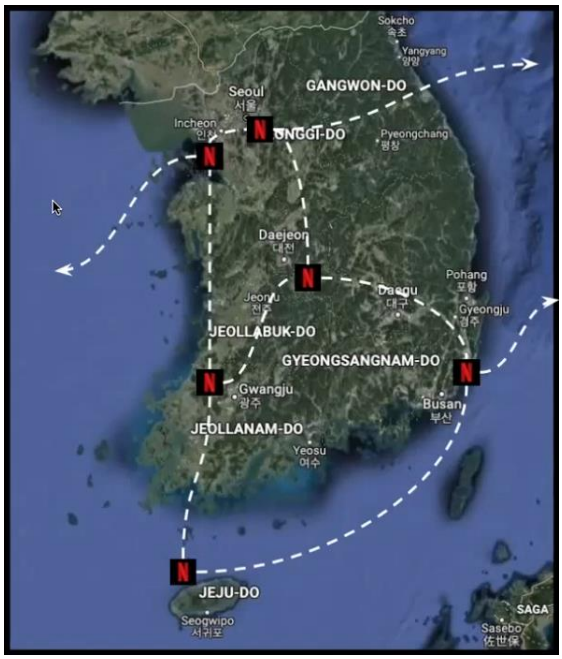
- On the ISPs' side:
  - there is no incentive to hosting and/or providing transit to content providers, as they have to pay fees to send content to another ISP,
  - there is no incentive to develop international connectivity and provide transit services, as those with better connectivity would become a source of traffic flows and then must pay termination fees,
  - there is no incentive to attract customers of content providers, as they have to pay more interconnection charges to their peering networks.
- Local content providers (e.g. Naver, GMarket, Kakao) see their charges increase and their growth hampered as now they have to pay for content delivery. Unlike international competitors, local content providers are not able to store content outside the country and avoid SPNP rule between ISPs.
- From the final user's point of view, charging the delivery of data would contribute to the rise of Internet access charges, or in the form of a higher subscription price and the lack of further investment in international connectivity would hamper quality of experience for users.

2.2.3 Netflix vs. ISPs on network usage fees

Netflix stores its content close to every user: Its CDN called "Open Connect"[22] partners with ISPs to deploy servers everywhere in the world. Having localised content strongly lowers network traffic and thus traffic cost. In Korea, Netflix content is 100% served locally, even in Jeju-Do.

[20] It went into effect in 2016.
[21] Since 2020, free peering is possible again under certain conditions.
[22] More than 14000 open connect appliances spread across 142 countries, 2020.

Figure 2.4: Netflix CDN in Korea



A currently ongoing litigation between ISPs in Korea and Netflix is dealing with whether Netflix must pay ISPs for delivering traffic to subscribers, which is known under the legal term of "network usage fees". In September 2021, SK Broadband brought a countersuit against Netflix to claim network usage fees. The discussion is still on-going, and the potential implementation of such fees would impact the Netflix end user: "Even if we have to pay for the network use, we won't increase the subscription fee immediately. However, we've been reviewing raising subscription fees as there hasn't been any increase in the fee since Netflix entered the Korean market in 2015."[23] (D. Garfield, vice president of global public policy, Netflix).

2.2.4 Pending legal matter on network usage fees

In Korea, ISPs are advocating a "network user fee" that would be paid by the Content Providers. Policy makers have been investigating regulated network charges between ISPs that would require payments calculated on the volume of traffic delivered by the ISP. There are currently six pending pieces of legislation on this matter that are discussed in a parliamentary IT subcommittee.

A "network usage fees" scheme appears to be very different from the global standard and contrary to the network neutrality principle, where end users pay a fee to their ISP to be able to access Internet whatever the type of content and where it comes from, with no extra cost and no discrimination.

Applying a network user fee would add additional costs for content providers operating locally and contribute to encourage content be hosted outside South Korea (and then making it more expensive for ISPs to access content and entailing inefficiencies). There would also be a risk that termination cost passed on the final user (for Netflix content) and on content providers (for YouTube[24]). Another consequence would be a lower quality of consumer service (higher latency). Current discussions on content charges and how they would apply create some uncertainty on the market, as well as potential consequences on slowing innovation and investment.

[23] https://www.kedglobal.com/newsView/ked202111040013
[24] User-generated content

3 Australia

3.1 Overview of the Internet landscape

In Australia, 90% of the population is using the Internet[25]. Mobile networks cover most of the population (Figure 6): 4G 99.5% and 5G 75%. The fixed network represents the most important part of the Internet market as it is responsible for most data transfers both nationally and globally. Average monthly fixed broadband traffic per subscriber accounts for 282.2GB in contrast with 8.9 GB for mobile traffic.

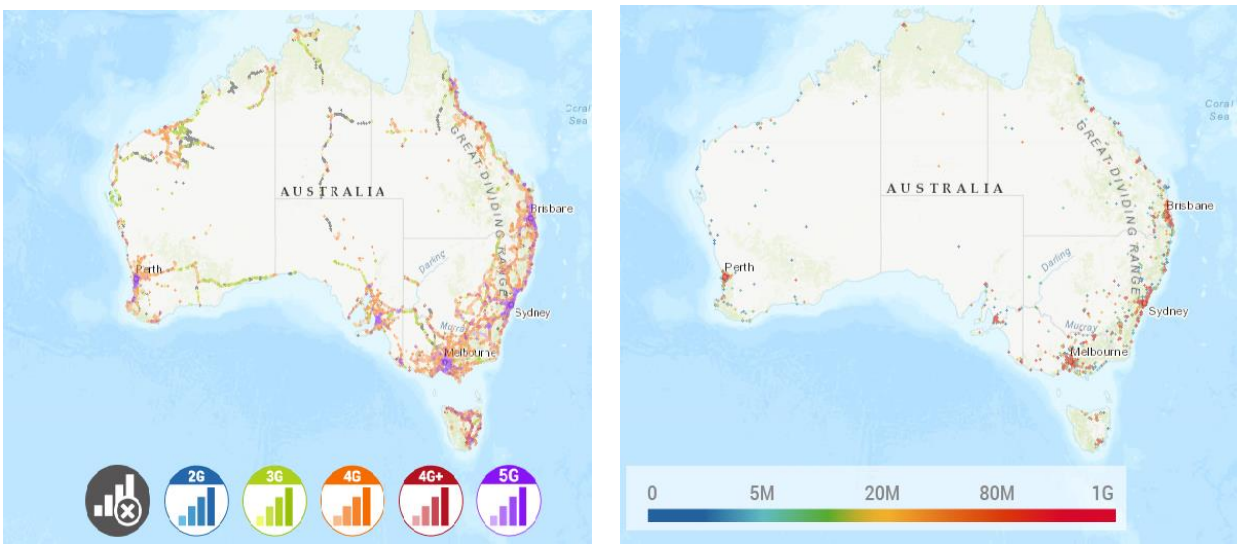
At the local access level, the Australian market has seen some interesting change with multiple acquisition and mergers resulting in higher market concentration[26].Today, the country hosts 3 major MNOs who own and operate mobile network infrastructure. Telstra is the largest provider with 48.7% market share, followed by Optus (26.3%) and TPG Telecom (15.3%). the three operators offer services directly to consumers and via resellers.

Initially designed to replace Australia's fixed telecommunications networks, the National Broadband Network (NBN) is the primary wholesale network for carrying Australia's fixed-line voice and data services. NBN Co which is the state-owned company operating the network provides a range of technologies including fibre (72%), hybrid-fibre coaxial (23%), fixed wireless (4%) and satellite (1%). In addition, the NBN is also important for the MNOs as it provides the necessary backhaul services.

NBN Co doesn't provide Internet access directly to end-users. Retail ISPs are responsible for setting up the last mile connectivity. However, while NBN Co is the primary wholesaler for retail services, other network providers may build and commercialise wholesale fibre services. Larger non-NBN network operators may operate both retail and wholesale businesses subject to the acceptance by the regulator (ACCC, Australian Competition and Consumer Commission) of a functional separation undertaking, or by the network operator electing to be bound by the ACCC's deemed functional separation undertaking. The ACCC accepted a joint functional separation undertaking from Uniti Group Limited (Uniti) in October 2020.

[25] Source: ITU (2020)
[26] The latest merger between TPG Telecom and Vodafone Hutchison

Figure 3.1: Mobile coverage and download speed in Australia (Telstra)

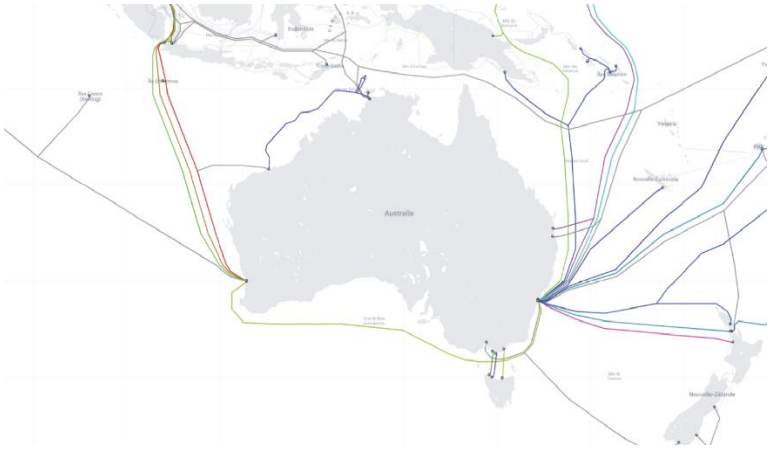


Source: nPerf[27]

3.1.1 Submarine cables

Both fixed networks such as the NBN and most wireless networks connect into the submarine cables landing in Australia to send data globally. As of June 2021, there were 14 submarine cables connecting Australia to the rest of the world while 3 other cables were under construction (Figure 3.2)

Figure 3.2: Submarine cables connecting Australia



Source: Telegeography[28]

[27] Source: https://www.nperf.com/en/map/AU/-/-/signal/?ll=-35.072138656770 91&lg=136.01&zoom=3 accessed 7/3/2022
[28] Telegeography Submarine Cable map; Available at: https://www.submarinecablemap.com/country/australia

3.2 Overview of the regulatory context

3.2.1 Public wholesale network

Australia's NBN is the largest public investor in broadband in the country. Government has built and operates the national wholesale network in order to promote competition at the retail fixed broadband level and accelerate infrastructure buildout. In 2013, a Special Access Undertaking (SAU) was established as a long-term regulatory framework. It provided NBN Co with the opportunity of recovering its costs, including an appropriate return on investment by regulating prices, thus offering a degree of long-term pricing certainty to industry. Additionally, the SAU sought to provide incentives for NBN Co to innovate and invest in improved services such as enhanced service levels, improved connection technologies and greater capacity.

Recently ISPs have raised concerns about the impacts on the retail market structure and the price level of NBN Co. Since its kick-off, the overall outcome of the project has been contrasted as it faced multiple setbacks. The initial objective was to connect 93% of households and businesses to a wholesale FTTP but due unexpected costs and political change, the government downgraded to FTTN network. For instance, six years after it started, fixed broadband Internet coverage and adoption rates have slowed, while mobile Internet growth has kept constant despite increased investments.

Mid-2021, the ACCC hosted an industry roundtable to discuss updates to the regulatory arrangements for the NBN that could be established through a revised SAU. 3 working groups comprised of key stakeholders were established and a revised SAU is expected in early 2022.

3.2.2 Interconnection arrangements

The Australian Competition & Consumer Commission (ACCC) has assessed Internet interconnection arrangements in the country.

Despite no clear evidence of anti-competitive behaviour being identified, the ACCC considers that the three operators hold some market power due to the size of their networks and has identified some transit pricing inefficiencies[29].

The Commission acknowledges that the publication of peering criteria by Optus, Telstra and TPG has increased transparency of market information: These criteria enable peering parties to validate they would receive equal value from entering a peering arrangement. The ACCC also welcomes the recently closed peering relationship between Telstra and Vocus, which should "improve the ability of Vocus to provide competitive wholesale transit services to other providers, with positive flow on impacts in downstream markets including the corporate Internet market"[30].

[29] Economic and social impact of Meta's submarine cable investments in APAC, Analyses Mason, December 2021, https://www.analysysmason.com/contentassets/0c7320380f594f59885246a8918a2fce/analysys_mason_meta_submarine_cable_asia_study.pdf

[30] https://www.accc.gov.au/regulated-infrastructure/communications/Internet-interconnection/accc-assessment-of-Internet-interconnection-arrangements/Internet-interconnection-update

4 Indonesia

4.1 Overview of the Internet landscape

Indonesia is a vast archipelago of some 17,000 islands, with 43% of its 276 million population living in rural locations. While still relatively low, there has been strong growth in the adoption of fixed broadband services in the past few years: Over 2015-2020, the adoption rate has grown from 6.3% to 16% of households. FTTH and DSL make up most fixed connections.

Mobile coverage of 4G networks has also expanded rapidly in the last five years, reaching almost 96% in 2020. Mobile broadband adoption has doubled from 25.4 to 52.5 per 100 inhabitants[31] over the same period. Monthly mobile data usage was 6.5GB per subscription as of 2020, compared to fixed broadband usage of 66GB per subscription.

There are three main Internet Service Providers (ISP) in Indonesia offering fixed and mobile Internet access. These are:

- Telkom Indonesia, the incumbent and largest fixed and mobile operator in the country,
- XL Axiata, a subsidiary of Axiata Group, and
- PT Indosat Ooredoo Hutchison Tbk.[32]

According to a study by Akamai[33], Internet traffic in Indonesia has grown 73% (YoY) in the first quarter of 2020 and 139% in the second quarter. While 54% of the population is using the Internet, most of the Internet activity is spent watching videos (98%) or streaming television content (50%). The average time spent online by Internet users in the country is 6 hours and 36 minutes[34].

4.1.1 Tech companies' infrastructure investments

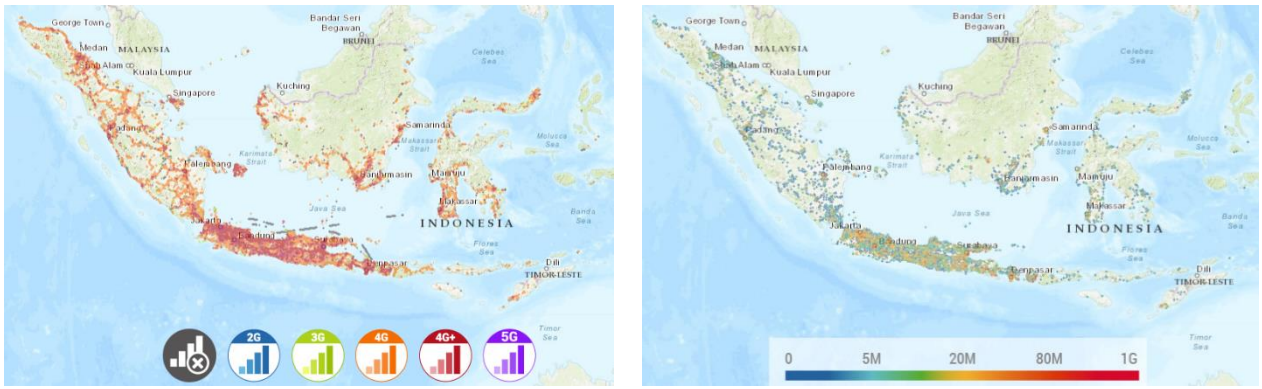
In Indonesia, Alita and Facebook are investing in 3,000 kilometres[35] of metro fibre to connect more than 1,000 cell sites in Bali, Java, Kalimantan, and Sulawesi. This is Facebook's largest single terrestrial fibre initiative in Asia to date, and when fully completed, this fibre will bring higher speed Internet services to more than 10 million people. Alita will wholly own, build, maintain and operate the network and provide wholesale capacity to MNOs and ISPs. The fibre is open access, providing fair and equitable access to all service providers.

Google has invested in edge infrastructure and deployed Google Global Cache (GGC) nodes in the operators' networks across 34 cities in Indonesia[36]. This enables latency improvements and Internet speed increase for both Google and the ISPs customers.

The company is also an investor in the Indigo cable which connects Australia, Singapore, and Indonesia. Besides bringing additional bandwidth into the country, the Indigo cable enhances route diversity.

[31] Unique subscribers. Source: GSMAi 2020
[32] This is the newly created entity after the recent merger between Hutchison and Indosat
[33] https://www.telin.net/download/downloadWhitePapers?catalog=6_FINAL_Indonesia%20Media%20Report%20(interactive).pdf
[34] https://datareportal.com/reports/digital-2022-indonesia
[35] https://a4ai.org/advancing-connectivity-between-the-asia-pacific-region-and-north-america-qa-with-tom-chottayil-varghese-head-of-connectivity-and-access-policy-asia-pacific-facebook/
[36] https://www.analysysmason.com/contentassets/b8e0ea70205243c6ad4084a6d81a8aa8/indonesia-country-chapter.pdf

Figure 4.1: Mobile coverage and download spend in Indonesia (XL Axiata)



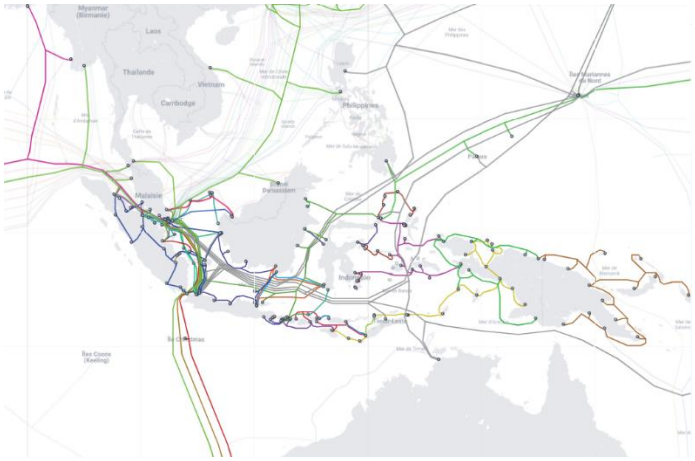
Source: nPerf[37]

Submarine cables

The archipelago's nature of Indonesia implies that the submarine cables network play an important role in facilitating data transfer, Internet access and cloud storage. The country is connected to 18 international submarine cable systems (see Figure 4.2) and while this is a relatively large number, it seems that submarine routes are largely directed to Singapore.

Submarine cable owners in Indonesia face some barriers that could hamper future investments. It includes a lengthy process to get submarine cable landing approved and a regulatory requirement to partner with a local company.

Figure 4.2: Submarine cables connecting Indonesia



Source: Telegeography[38]

[37] Source: https://www.nperf.com/en/map/ID/-/2992.XL-Axiata/signal/?ll=-2.5479878714713835&lg=118.037109375000001&zoom=5 nPerf (Accessed 7/3/2002)
[38] Telegeography Submarine Cable map; Available at: https://www.submarinecablemap.com/country/indonesia

4.2 Overview of the regulatory context

4.2.1 Absence of net neutrality requirements

In Indonesia, the telecommunications sector including the Internet is regulated by the Ministry of Communication and Information Technology (MCIT). There are no net neutrality requirements applicable in the country.

As such, ISPs are in principle not prohibited to block different types of traffic over their networks[39].

4.2.2 Data localization mandate

In 2012, the local government adopted a data localization mandate[40] requiring all websites and applications that provide online services to store data within Indonesia's territorial jurisdiction. The mandate's goal was to help Indonesian law enforcement officials force private Electronic Systems Operators (ESOs) — anyone that operates "electronic systems" for users within Indonesia, including operators incorporated abroad — to provide data during an investigation.

The 2012 regulation was largely not enforced and a 2019 follow-up initiative (GR71 regulation[41]) limited the data localization mandate to those processing government data from public bodies.

4.2.3 Content regulation

In 2020, Indonesia's Ministry of Communication and Information Technology issued the *Regulation of the Minister of Communication and Informatics Number 5 of 2020 on Private Electronic System Operators* (called MR5)[42]. MR5 governs all 'Private Electronic Systems Operators' (Private ESOs) doing business in Indonesia, including both Indonesian services and platforms as well as multinational companies such as Facebook, Twitter, or Google. It grants the government overbroad authority to regulate their activity and to have direct access to user data and the contents of communications and establishes excessive penalties for noncompliance.

The regulation establishes obligations for Private ESOs concerning the removal of prohibited content in a way that does not comply with international standards concerning intermediary liability. Private ESOs are required to comply with most content removal orders within 24 hours for most content and within 4 hours for 'urgent' take down requests, such as those involving terrorism, child sexual abuse images, or 'content that disturbs the community or public order.' However, MR5 provides no further clarity on the definition of 'public order.'

In addition, MR5 requires Private ESOs to obtain a registration certificate and designate at least one local 'Contact Person' in Indonesia. This widely contested[43] regulation came into force in November 2021 with little stakeholder consultation.

[39] https://iclg.com/practice-areas/telecoms-media-and-Internet-laws-and-regulations/indonesia
[40] https://www.eff.org/deeplinks/2021/11/indonesian-court-allows-Internet-blocking-during-unrest-tightening-law-enforcement
[41] https://www.abnrlaw.com/news_detail.php?send_news_id=366&year=2019
[42] https://www.article19.org/resources/blog-indonesias-intermediary-regulation-imperils-Internet-freedom/
[43] https://www.article19.org/resources/indonesia-repeal-ministerial-regulation-5/

5 Japan

5.1 Overview of the Internet landscape

There are three established MNOs in the Japanese market, lead MNO KDDI (mobile brand *au*), NTT Docomo, and SoftBank, as well as one recent entrant, Rakuten Mobile. The parent companies of the three established MNOs each own fixed telecommunications companies, which provide consumer and business services (including fixed Internet), as well as other digital and media businesses[44]. They are also active players at the interconnection level and provide transit services for other players.

As an offshoot from e-commerce and online services of Rakuten Group, Rakuten Mobile first entered the Japanese market as an MVNO in 2014, offering low-cost voice and data services, and launched as a full MNO in 2020. It relied on KDDI capacity in order to offer national coverage to support rollout of its own 4G network[45]. Rakuten's launch as an MNO was managed by MIC through a licence application process for new spectrum released in 1.7 GHz and 3.4 GHz bands in 2017-18[46]. All four MNOs have launched 5G services[47]. The entry of Rakuten as a full MNO appears to have increased price competition with lower price plans being launched in efforts to capture larger market share, while the incumbents have also responded with their own discounted offers.[48,49]

There are more than 80 MVNOs currently active in Japan, which includes 10 MNO sub-brands[50]. These MVNOs are supported by the three established MNOs and UQ Communications, a company specialising in provision of WiMAX services[51]. As of 2021 Q1, there were 26.12 million MVNO subscribers which accounted for approximately 13.4% share of the mobile market[52].

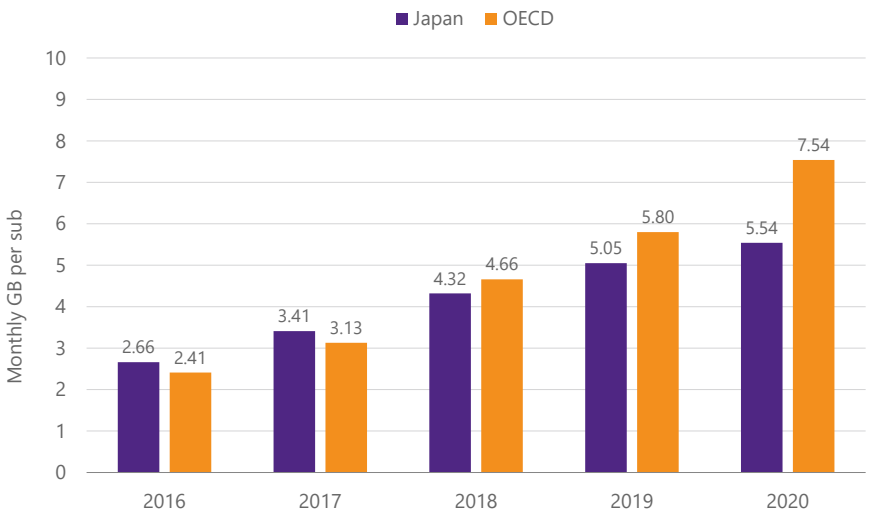
FTTH household coverage in Japan is at 99.1%. This has also contributed to the availability of fibre backhaul to support mobile network performance and, along with high prices for mobile services, contributed to offloading onto Wi-Fi networks.

5.1.1 Network performance and usage

Japan ranks lower in terms of monthly mobile data consumption per user than the OECD average[53]. While mobile data usage has increased by more than two-fold between 2016 and 2020, the rate of growth has been lower than that seen in many international comparators.

[44] For example, SoftBank Group includes data centre company IDC Frontier, publishing company SB Creative, and gaming company GungHo Online.
[45] Telegeography, 8 April 2020, Rakuten Mobile launches low-cost mobile plans in Japan. Available at: https://www.commsupdate.com/articles/2020/04/08/rakuten-mobile-launches-low-cost-mobile-plans-in-japan/
[46] Telegeography, 9 April 2018, MIC advisory panel gives green light to Rakuten's mobile bid. Available at: https://www.commsupdate.com/articles/2018/04/09/mic-advisory-panel-gives-green-light-to-rakutens-mobile-bid/
[47] GlobeNewswire, 10 June 2020, Japan's four MNOs all launch 5g. Available at: https://www.globenewswire.com/news-release/2020/06/10/2046351/0/en/Japan-s-four-MNOs-all-launch-5G.html
[48] Kyodo News, 29 January 2021, Rakuten to offer lowest monthly large mobile data plan for 1,980 yen. Available at: https://english.kyodonews.net/news/2021/01/3aafb80ddb83-rakuten-to-offer-cell-phone-plans-with-up-to-1-gigabyte-free-data.html
[49] FierceWireless, 29 January 2021, Rakuten Mobile ratchets up wireless price war. Available at: https://www.fiercewireless.com/operators/rakuten-mobile-ratchets-up-wireless-price-war
[50] This includes three KDDI sub-brand MVNOs, four NTT sub-brands, two SoftBank, and Mineo. Source: GSMA Intelligence, 2021.
[51] UQ Communications uses 2.6 GHz TDD to provide its WiMAX2+ services
[52] MIC, March 2021, "Publication of quarterly data on number of telecommunications service contracts and market share." Available (in Japanese) at: https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000187.html
[53] OECD, 2021, Broadband Portal – Penetration and data usage. Available at: https://www.oecd.org/digital/broadband/broadband-statistics/ Statistics: Mobile data usage per mobile broadband subscription.

Figure 5.1: Mobile data usage trends - Japan vs. OECD



Source: Plum analysis, MIC (spectrum awarded and data usage for 2020), OECD (data usage; 2019 latest reported)

According to Data Reportal, there were 118.3 million Internet users in Japan in January 2022 and average daily time spent using the Internet by each Internet user amounted to 4 hours and 26 minutes[54]. Figure 5.2 illustrates the most popular apps by monthly usage, with 75.3% of Internet users using mobile chat messaging apps, 74.7% using social media apps and 58.1% using entertainment and video apps.

Figure 5.2: Monthly app use among Internet users (16-64 years) in Japan (2020)

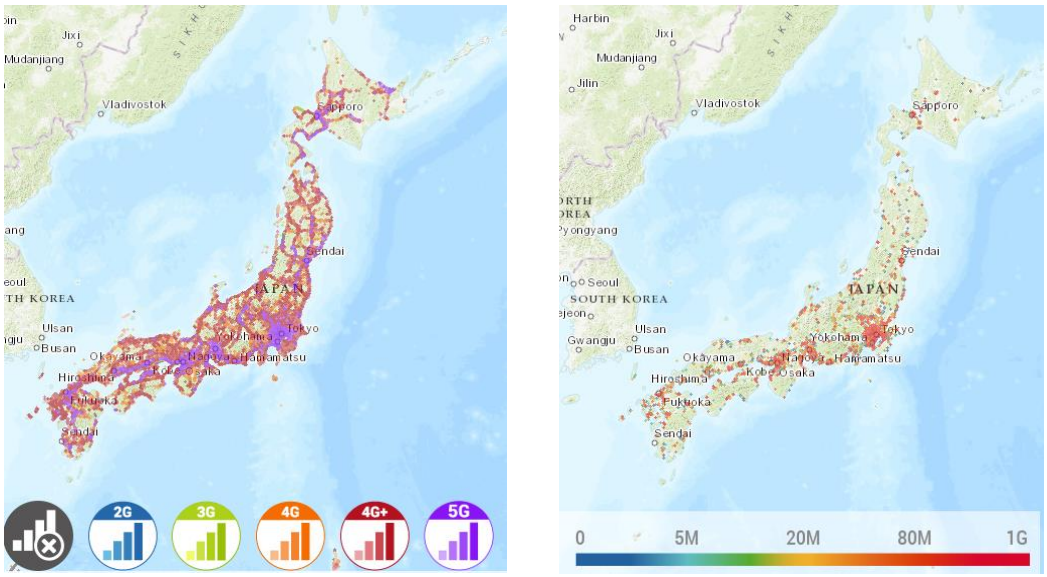
Type of mobile app	Percentage of Internet users 16-64 years
Chat (messengers)	75.3%
Social networking	74.7%
Entertainment and video	58.1%
Music	34.0%
Games	39.2%
Shopping	48.4%
Map	56.5%
Banking and financial services	24.7%
Health, fitness and nutrition	12.9%
Dating and friendship	3.9%

Source: GlobalWebIndex

KDDI, NTT Docomo and Rakuten scored amongst the global leaders for 4G availability along with 10 other MNOs from South Korea, Singapore, and India among others[55]. Figure 5.3 shows mobile coverage and download speeds for incumbent NTT Docomo.

[54] https://datareportal.com/reports/digital-2022-japan
[55] Opensignal, February 2022, Global Mobile Network Experience Awards 2022. Available at: https://www.opensignal.com/sites/opensignal-com/files/data/reports/pdf-only/data-2022-02/opensignalglobalmobilenetworkexperiencefebruary2022_3.pdf

Figure 5.3: Mobile coverage and download speeds (NTT DOCOMO)



Source: nPerf[56]

5.1.2 Submarine cables

Japan is considered a hub for telecommunications in the APAC region. There are more than 20 international submarine cables connecting Japan to other countries such as the US, Australia, and Russia[57]. These are mainly laid on the country's eastern Pacific Ocean side (Figure 5.4) with many concentrated in areas such as Tokyo and Shima[58].

The Japanese Government has announced its intention to decentralize landing bases on other areas to strengthen economic security. The 'Digital Garden' initiative[59] aims to build more than a dozen data centres in rural areas over the next five years, as well as laying a fibre cable off Japan's west coast. In November 2020, Prime Minister Fumio Kishida ordered cable distribution while announcing the establishment of a fund of about 50 billion yen (about 400 million euros) in the supplementary budget for 2021.[60]

[56] https://www.nperf.com/en/map/JP/-/187898.NTT-DoCoMo/signal/?ll=35.49256143590625&lg=134.47500000000002&zoom=4 (accessed 7/3/2022)
[57] https://www.submarinenetworks.com/stations/asia/japan#:~:text=there%20are%20more%20than%2020,%2C%20FASTER%2C%20NCP%2C%20Jupiter.
[58] https://subtelforum.com/japan-plan-new-cable-and-data-centers-around-island/
[59] https://www.japan.go.jp/kizuna/2022/01/vision_for_a_digital_garden_city_nation.html
[60] https://www.datacenter-forum.com/datacenter-forum/government-japan-disperses-submarine-cable-bases-to-reduce-security-risks

Figure 5.4: Submarine cables connected to Japan

Source: Telegeography[61]

5.2 Overview of the regulatory context

5.2.1 Telecommunication Business Act (the Telecom Act)

In Japan, the Ministry of Internal Affairs and Communications (MIC) regulates the Internet and IP-based services along other types of telecommunications, under the Telecommunication Business Act (the Telecom Act). It outlines requirements on telecommunications services and network providers and a number of disclosure and reporting obligations and sets out access requirements. The Telecom Act also emphasizes the protection of the secrecy of communications that protects consumers' personal communications data (No ISP or other Internet player can access these communications).

The MIC does not regulate technical standards for Internet protocol, but part of its mandate is to enhance Japan's information and technology infrastructure. In 2003, MIC established a study group to facilitate the transition from Internet Protocol version 4 ('IPv4') to Internet Protocol version 6 ('IPv6') and in 2007, MIC issued guidelines to encourage governmental entities to prepare for IPv6 within one year[62]. In addition, the MIC doesn't intervene at the interconnection level. Transit and peering arrangements are freely negotiated between the different players.

5.2.2 Universal broadband service

Japan has no law requiring universal broadband service. However, the MIC's Information and Communications Council announced in December 2019 that it is considering extending universal service requirements to include broadband service.

[61] Telegeography Submarine Cable map. Available at: https://www.submarinecablemap.com/country/japan
[62] https://www.lw.com/thoughtLeadership/tmt-review-japan-october-2011

5.2.3 The Internet Provider Liability Limitation Act

The Internet Provider Liability Limitation Act protect ISPs on content deletion: If ISPs reasonably believe that the content infringes the intellectual property rights or privacy of others, or if a third party alleges infringement and the content sender does not respond to the ISP's inquiry within seven days, ISPs can't be held liable for the deletion of content on their network.

5.2.4 Protection of digital platform users (the Platform Act)

Pushed by the MIC, the Ministry of Economy, Trade and Industry (METI), and the Japan Fair Trade Commission (JFTC) - and enacted in June 2020 - the Platform Act aims to protect both marketplace stakeholders and end-customers by requiring more transparency and fairness in the way platform providers trade on their digital platforms. It applies to both foreign and domestic companies.

Specified digital platform are subjects to three types of obligations:

- Disclosure requirements,
- Requirements to establish procedures and structures to effectively communicate with marketplace participants and to handle inquires and complaints from marketplace participants, and
- Requirements to submit annual reports to METI on the compliance status and self-assessment thereof with respect to compliance with the requirements.

6 Singapore

6.1 Overview of the Internet landscape

Singapore is one of the most connected countries in the world with high fixed and mobile broadband penetration. The fixed broadband network reached the milestone of nationwide coverage as early as 2013. For a long time, the Internet market in Singapore had been a three-player market. Singtel, Starhub and M1 were the only operators offering both fixed and mobile Internet access. In 2016-17, TPG entered the mobile market and deployed its own network. It launched its first commercial service in March 2020. Since 2016, there has been increased competition in the mobile sector in Singapore due to the entry of several MVNOs and this has driven down retail prices for mobile services. 4G nationwide coverage has also been achieved in 2013[63] (See Figure 14).

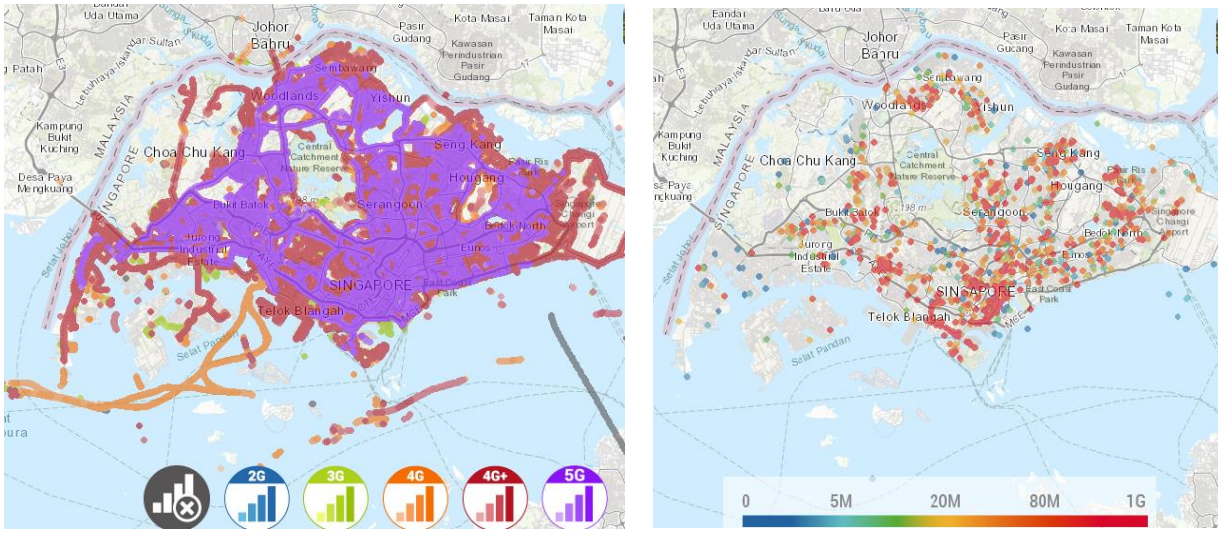
Under the Intelligent Nation 2015 (In2015) master plan, Singapore has developed its next generation nationwide broadband network (Next Gen NBN)[64] which is the country's wired network infrastructure. OpenNet Consortium, a private entity led by Axiata was selected to design, build, and operate the passive infrastructure of the network. The active infrastructure of the Next Gen NBN was managed by a different entity, Nucleous Connect, a subsidiary of StarHub. The company was responsible for building a fibre-to-the-home (FTTH) architecture using GPON and Active Ethernet network elements.

As of 2020, 92% of Singapore's population is using the Internet. The average amount of time spent online by Internet users is 7h29min[65] and in 2021, Internet users have reportedly spent USD 411.9 million on digital media, with 50% of this amount on video games only[66].

At the IP interconnection level, the Singapore market is one of the most competitive in the region as many national and international operators have Points of Presence (PoPs) in the country. Internet connectivity can be sourced from multiple sources and operators are able to optimise their IP transit regarding both quality and price[67]. Singapore is often considered as an information and technology hub in the region and is base for most of the world's biggest tech companies including Microsoft, Oracle, AWS and Google.

[63] https://www.tech.gov.sg/media/technews/history-of-the-Internet
[64] https://www.imda.gov.sg/programme-listing/wired/next-gen-nbn#:~:text=The%20NBN%20is%20the%20pervasive,be%20a%20leading%20digital%20economy.
[65] https://datareportal.com/reports/digital-2022-singapore
[66] https://datareportal.com/reports/digital-2022-singapore
[67] https://www.imda.gov.sg/-/media/imda/files/inner/pcdg/consultations/20150213_ippeering/explanatory-memorandum---ip-transit-and-peering-landscape-in-singapore.pdf?la=en

Figure 6.1: Mobile coverage and download speeds (Singtel Mobile)

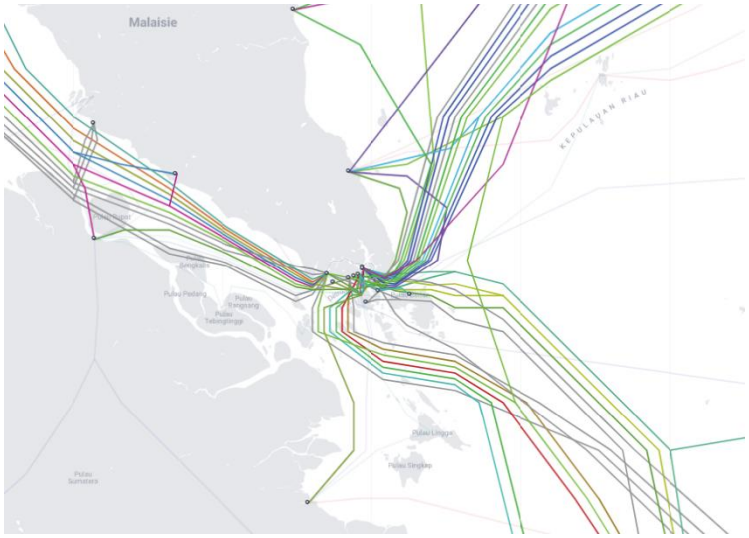


Source: nPerf[68]

6.1.1 Submarine cables

Singapore is a connectivity hub in the APAC region. As such, many submarine cables have been developed and are developing. An additional one is expected by 2025: It will be 19,200-kilometer-long and will connect Singapore to France and traverse Malaysia, Bangladesh, Sri Lanka, India, Pakistan, Djibouti, Saudi Arabia, and Egypt. Figure 15 below shows the cables connecting Singapore.

Figure 15: Submarine cables connecting Singapore



Source: Telegeography[69]

[68] Source: https://www.nperf.com/en/map/SG/-/18187.SingTel-Mobile/signal/?ll=1.3355039025448037&lg=103.82449999999999&zoom=11 (Accessed 7/322)
[69] Telegeography Submarine Cable map. Available at: https://www.submarinecablemap.com/country/singapore

6.2 Overview of the regulatory context

The regulator's approach (Infocomm Media Development Authority) to regulating the Internet is described as "pragmatic and balanced"[70]. The regulatory framework for the Internet is embodied in the Broadcasting (class licence) Notification under which Internet service providers and content providers are licensed. This is a light-touch automatic class licence scheme that requires Internet service providers and content providers to comply with an Internet Code of Practice[71]. Internet service providers operating in Singapore are required to offer optional Internet filtering services to their subscribers.

In addition, industry self-regulation is encouraged in the country[72]. The IMDA promotes the development of industry codes of practice which can be used to promote greater industry self-regulation and complement existing Internet content regulations. The regulator does not restrict or monitor individuals' access to online content and individual webpages are not regulated.

In 2015, the regulator has reviewed the IP transit and peering landscape in Singapore[73]. From the study and public contributions, it concluded that there was no evidence that the IP transit and peering landscape was not functioning well. It thus decided that there was no need for public intervention in IP transit and peering arrangements. However, the regulator recommended that the transparency of IP peering policies of operators should be improved in order to help facilitate interconnection arrangements between interested parties

[70] https://www.imda.gov.sg/regulations-and-licensing-listing/content-standards-and-classification/standards-and-classification/Internet
[71] https://www.imda.gov.sg/regulations-and-licensing-listing/content-standards-and-classification/standards-and-classification/Internet
[72] https://www.imda.gov.sg/for-community/Infocomm-regulation-and-guides/infocomm-regulation/Internet-content-regulation
[73] https://www.imda.gov.sg/-/media/Imda/Files/Inner/PCDG/Consultations/20150213_IPPeering/Explanatory-Memorandum---IP-Transit-and-Peering-Landscape-in-Singapore.pdf

