



5G INDO PACIFIC SURVEY

CONNECTIONS AND CONFLICT

JAWEI

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**Indo-Pacific
5G survey:
Connections
and conflict**

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1

Introduction

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5G: Connection and conflict



5G will likely become one of the foundational technologies of the Fourth Industrial Revolution, enabling new applications in the realm of the Internet of Things (IoT), instant and seamless consumption of digital products and vastly improved connectivity for smart cities and smart factories. Two standout features—phenomenal speed and stunning reductions in latency—will separate current 4G/LTE networks from fifth generation networks (5G).

However, a hyper-connected world in a 5G embrace is ripe for cyberattacks at a scale never seen before, from simple household IoT devices to critical infrastructure like electricity grids and healthcare delivery systems. 5G will create unprecedented productivity but also bring unprecedented vulnerability. As Mike Burgess, Australia’s then-Director General of the Signals Directorate said in 2018, “Historically, we have protected the sensitive information and functions at the core of our telecommunications networks by confining our high-risk vendors to the edge of our networks. But the distinction between core and edge collapses in 5G networks. That means that a potential threat anywhere in the network will be a threat to the whole network.”¹ It is precisely this calculus that makes 5G and the decision to use or not use certain vendors so uniquely polarising.

Today, nations are faced with the apparent binary of Chinese and Western technology. US president Joe Biden’s nominee for commerce secretary, Gina Raimondo, has made it clear that the new administration will not diverge from Donald Trump’s war-like resistance to Huawei both within the US and beyond. Such was the US’ battering ram style on this issue that in December 2019,² Canada’s border agents arrested Huawei’s chief financial officer Meng Wanzhou at the request of the US—known in China as the company’s “princess”—as she changed planes in Vancouver.



In the first half of 2020, Huawei generated revenues of ~US \$63 billion, up 13.1 percent from the same period a year earlier.³ The company was involved in 140 commercial 5G deployments across 59 countries.⁴ That business landscape is shifting. Samsung of South Korea, India's Jio, and NTT Docomo in Japan are all betting on indigenous networks based on advanced software, off the shelf hardware and open standards.

The tech battle between the US and China has become a major setback for Huawei and torn into the well laid plans of companies—not just American—that produce and sell in China. Nearly half (47 percent) of the world's chips are sold globally by US firms like Intel and Qualcomm.⁵ Beijing is now pouring resources into high-tech chips as it seeks to decouple from the US. It has already invested US \$30 billion in its semiconductor companies. But decoupling is complicated. Huawei has not commented on its inventory, but analysts suggest that Huawei's stockpile will last at best another year or two.



The backlash against Huawei's 5G offerings came with unprecedented political attention in 2020 as global opinions about Xi Jinping's China soured in the wake of its early mismanagement of the COVID-19 pandemic. At the same time, Beijing's reach has grown even wider because of Huawei's role as one of the world's largest vendors of 5G technology. The Quad is reportedly looking to build upon a common approach to 5G,⁶ and in March 2021, leaders at the virtual Quad summit committed to launching a "critical- and emerging-technology working group to facilitate cooperation on international standards and innovative technologies of the future."⁷

This special report provides an overview of the 5G state of play across 17 countries, with an Indo-Pacific focus. The report covers the Quad, the nations of ASEAN, and Northeast Asia. All of these countries are in the process of rolling out/ building their 5G services and infrastructure, while refining their stance on how to deal with the vulnerabilities and geopolitical tensions they will necessarily inherit along the way.

The Indo-Pacific, home to some of most rapidly-growing digital economies in the world, will prove pivotal to the global 5G story.



Based on a variety of publicly available information and country policy documents, we rank each of these countries on a 1-5 scale along 5 parameters: National ban on Chinese 5G equipment, 5G readiness, Homegrown 5G, and, finally, legacy Chinese equipment from 2G/3G/4G. Readers of this report can also scroll through timelines which capture a range of government and corporate interventions specific to the Huawei issue. These range from tests and installations, policy moves, political wrangling and bans and exclusions.

Hardcoding safety into the system is on everyone’s mind, no matter where they stand on the arc between No way, Huawei and Huawei Strong.





Some countries have remained characteristically ambivalent, with Malaysia and Singapore emphasising their own security and quality standards, refusing to ban “certain vendors”, choosing instead to work with a mix of them—Huawei, ZTE, Nokia, Ericsson, and others—to build out their 5G infrastructure. Laos, Myanmar, Brunei, Thailand, Indonesia, Cambodia, Malaysia, South Korea, and Philippines lean heavily on China, and 5G is just a slice of that pie. In some cases, like that of Laos and Thailand, the entire country’s digital and telecommunications infrastructure is dominated by China. Other countries are stopping short of an official ban. Vietnam’s “quiet ban,” India’s “soft ban”, and Japan’s unofficial ban do not explicitly name China but have silently excluded Chinese vendors from their 5G bids.

Finally, Australia, Taiwan and, of course, the United States have placed explicit bans on Chinese vendors, and, despite Huawei’s sabre-rattling, these countries have successfully commenced their 5G rollouts within their projected timelines.

This report captures a big tent snapshot of the still spiralling 5G tensions as countries navigate a delicate balance between geopolitical strategy and economic linkages.

2

Australia

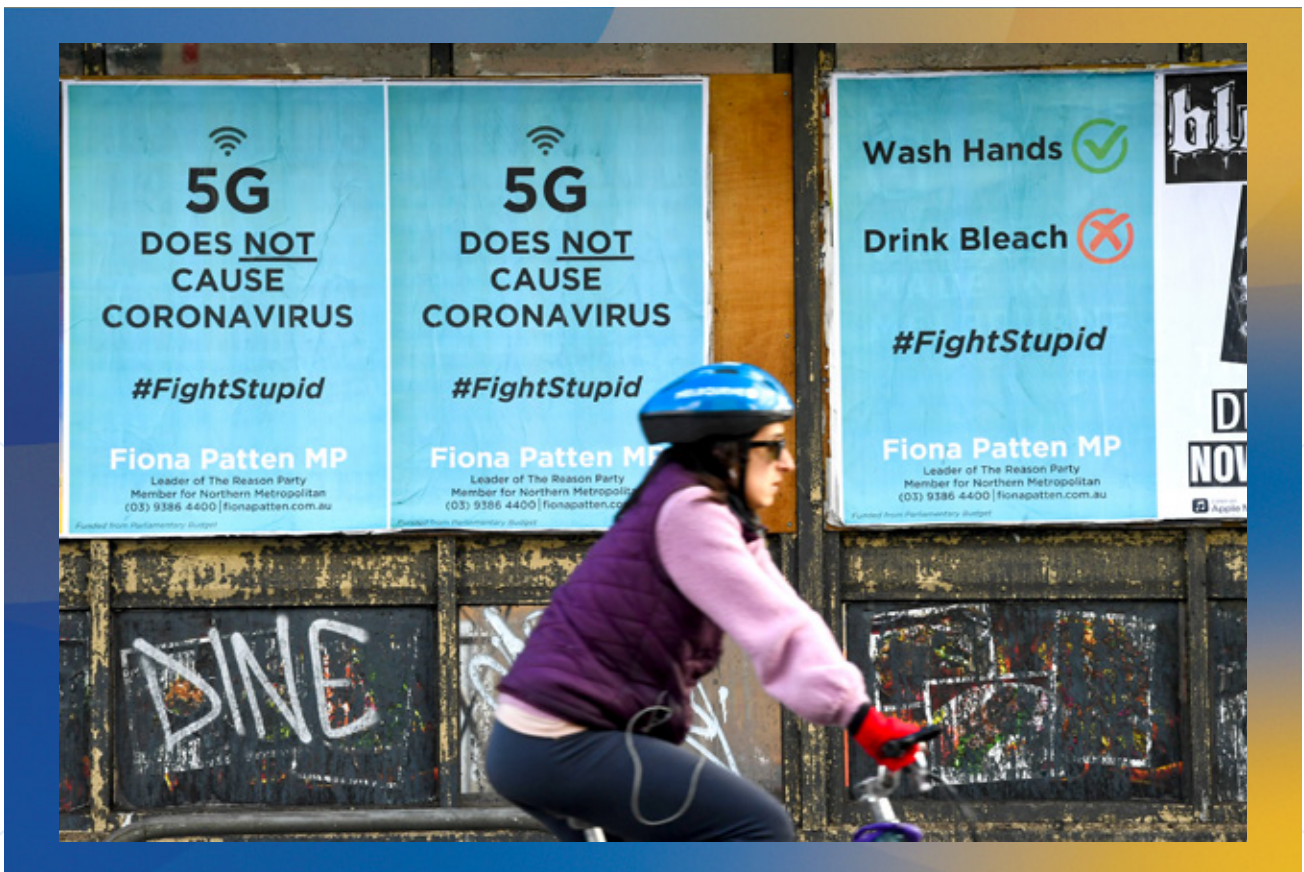
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Australia stands its ground



The Australian government has moved rapidly to enable a smooth, secure 5G rollout, with the aim of boosting the country’s economic growth, as well as user experience of key digital technologies. Per the Department of Communication’s 2017 5G: Enabling the Future Economy report, “[5G] provides the underlying architecture that will enable the next wave of productivity and innovation across different sectors of the Australian economy.”⁸

In August 2018, the Australian government became the first in the world to bar Huawei and ZTE from its 5G networks citing concerns regarding vendors “subject to extrajudicial directions of a foreign government that conflict with Australian law” and “unauthorised access or interference.” The ban was met with backlash from some telcos. Notably Vodafone (now merged with TPG Telecom), which had already started trials with Huawei, issued this statement: “This decision is a significant change which fundamentally undermines Australia’s 5G future, and we will consider what it means for our business.”⁹ Since then however, Australia’s major telcos, Telstra, Optus (a subsidiary of Singapore’s Singtel), and TPG Telecom have signed with Ericsson and Nokia for their 5G rollouts.





Yet Australia's rollout is not without its challenges. The Huawei ban has, for instance, led to rollout delays for Vodafone/TPG Telecom which had existing 4G and 5G agreements with Huawei.¹⁰ Misinformation surrounding the health effects of 5G also became a major policy concern. A Parliamentary inquiry on 5G received numerous submissions from participants citing the detrimental health effects of radiation from 5G cell towers; Australia's Chief Medical Officer issued a statement to reassure the public about the safety of 5G.¹¹

Nevertheless, Australia's telcos look set for a successful nationwide rollout in 2021. Telstra, the country's largest telecommunications provider, now boasts the country's largest 5G network, and its 5G coverage now reaches 41 percent of the country's population, with a projected coverage of 75 percent by June 2021.¹²

TIMELINE

October 2017: Department of Communication and Arts releases its 5G document, 5G—Enabling the future economy.

November 2017: Telstra and Ericsson announce that they have completed the world's first 5G data call on 256 Ghz mm Wave spectrum.¹³

November-December 2018: Australian Communications and Media Authority (ACMA) conducts 3.6 GHz band spectrum auctions.¹⁴

May 2019: Telstra launches limited 5G services on 3.6 Ghz band.¹⁵

March 2020: House of Representatives Standing Committee on Communications and the Arts releases the results of its inquiry on 5G.¹⁶

TPG Telecom begins 5G deployment.

May 2020: Telstra launches non-standalone commercial 5G services.

December 2020: ACMA announces results of 26Ghz and 28Ghz band auctions and opens further applications for unallocated high band 5G spectrum auctions, slated for April 2021.¹⁷

PARAMETERS

National ban on Chinese vendors: Yes

5G readiness: 4.5

Homegrown 5G: No

Legacy Chinese equipment from 3G/4G: 3.5

3

Brunei

—

**Progress through
national unity**



Brunei has had a slow start to its adventures in 5G compared to some of its Southeast Asian colleagues, having yet to open any test sites and with only a notional launch date of mid-2022 for the network. Brunei has, for the most part, been preoccupied with completing its 4G transformation and has also been plagued, as have many of its neighbours, with competing companies creating redundant infrastructure and wasting investments as a result. In order to solve the latter problem, in September 2019, the Government announced the nationalisation of the three largest telecommunication companies in the country, stating further that they would merge into the government-owned United National Networks, which inherited all of the telecom infrastructure in the country and will proceed with the future 5G rollout.¹⁸ Prior to that, however, it has decided to focus on the implementation of 4G networks as a way to build towards 5G in the future, and fill some gaps for consumers in the interim. Additionally, there has also been some degree of COVID-19-related delays, which has pushed the opening of test sites under this new arrangement to 2021.¹⁹ Brunei has welcomed Chinese investments in its telecommunications infrastructure as well as in its society writ large, and as such, much of the equipment for the future development of 5G will be provided by Huawei.



TIMELINE

September 2019: Government-owned Unified National Networks inherits telecom infrastructure from three different companies (TelBru, DST, and Progresif) to offer telecommunications to the whole country.²⁰

April 2021: First test sites for 5G in Brunei to open.²¹

Mid-2022: National 5G services to be launched.

PARAMETERS

National ban on Chinese vendors: No

5G readiness: 2

Homegrown 5G: No

Legacy Chinese equipment from 3G/4G: 4

4

Cambodia

—

**A small hurdle on the road
to the future**



Cambodia has seen remarkable progress on its 5G rollout in just a few years with numerous companies completing successful trial programs in 2019 and preparing for an imminent full release. This progress was temporarily stalled in 2020, when the Ministry of Posts and Telecommunications of Cambodia requested that future plans be put on hold until they have developed more robust policies and regulations for the rollout.²² A key concern of the government is efficiency in investments in a market that is rushing to compete; as a result the main focus of the policies under review, during the pause, is an investment roadmap that they hope will avoid the construction of redundant infrastructure. Prior to this hold, four companies—Smart Axiata, Cellcard, Metfone (a Vietnam based company) and South East Asia Telecom Group (SEATEL Group)—had successfully tested 5G architecture. The prevailing is Huawei.²³ The Cambodian government showed strong support for the Chinese telecommunication provider and has also signed a memorandum of understanding (MoU) with the Chinese company agreeing to have it build the country’s 5G network.²⁴ All four telcos have opted to use Huawei technology, including Metfone, a Vietnamese company that has refused to use Huawei technology for its Vietnam rollout, but has chosen to embrace the equipment provider for its Cambodian network.



TIMELINE

April 2019: Cambodia signs an MoU with Huawei for the company to build the country's 5G network.²⁵

August 2019: After comments from Telecommunications Regulator of Cambodia noting that free markets allow telecommunication companies to choose their equipment suppliers, the largest telecom companies in Cambodia announce that they will use Huawei equipment for their rollouts.²⁶

November 2019: Smart Axiata, Cambodia's biggest telecommunications operator, completes first 5G trial, using Huawei technology. Cellcard, another operator, completes its own trial which included both 5G towers and devices.²⁷

March 2020: Ministry of Posts and Telecommunications asks for a halt to 5G testing while it drafts policy.²⁸

PARAMETERS

National ban on Chinese vendors: No

5G readiness: 3

Homegrown 5G: No

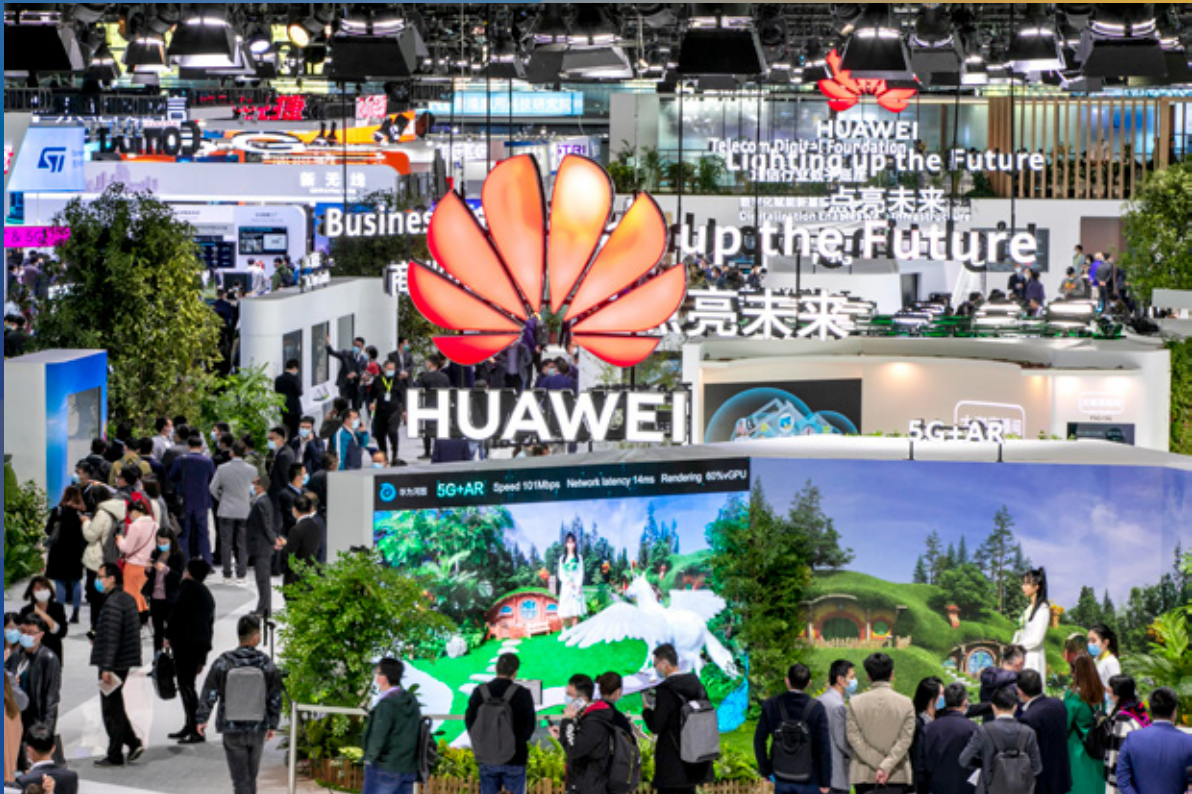
Legacy Chinese equipment from 3G/4G: 4

5

China

—

The eye of the storm



China is currently the world's largest 5G market, with the 5G rollout spearheaded by three state-owned telcos, China Mobile and China Telecom, which account for 76 percent of total mobile subscriptions, followed by China Unicom. The initial growth of 5G will be driven by mobile subscriptions, as services become available to more and more of the country's massive subscriber base. By 2024, 5G subscriptions are expected to account for over 50 percent of mobile subscriptions.

China's November 2019 5G launch was over non-standalone (NSA) networks: The race to expand 5G base stations is based on the push to move to standalone 5G networks, which will also offer better speeds and open 5G up to industrial applications. In May 2020, the NDRC has also released a framework for "new infrastructure", consisting of new information infrastructure (信息基础设施), integrated/fused infrastructure (融合基础设施), and innovation-related infrastructure (创新基础设施).²⁹ The "new infrastructure" framework includes building data and internet capacity, both industrial and for its broader population, as well as 4IR technologies. By July 2020, according to reports by the Ministry of Industry and Information Technology, Chinese telcos had built 400,000 5G base stations.³⁰ The target by 2025 is for 6.5 million base stations.³¹



China's primary 5G vendors, Huawei and ZTE, face an uncertain future not just due to external markets shutting their doors, but also at home as US export controls impact their supply chains.³² While reports surfaced in July 2020 that the Commerce Ministry was considering a ban on Ericsson and Nokia should the EU ban Huawei, Ministry of Foreign Affairs Spokesperson Wang Wenbin dismissed these as "fake news". He further said, "We oppose certain countries' generalisation of the concept of national security in banning specific companies from specific countries."³³

TIMELINE

February 2013: IMT-2020 5G Promotion Group established by Ministry of Industry and IT (MIIT), National Development Reform Commission (NDRC) and Ministry of Science and Technology (MOST).³⁴

June 2017: MIIT opens request for comments on 5G spectrum bands.

July 2017: Spectrum bands approved for 5G.

April 2018: 5G trials begin in 16 cities, including Shanghai, Guangzhou, Beijing, Chengdu, and Shenzhen.³⁵

December 2018: Low- and mid-band spectrum permits issued to China Mobile, China Unicom and China Telecom.

October 31, 2019: Commercial 5G services launched in 50 cities by the three state telcos.³⁶

PARAMETERS

Ban on External Vendors: No

5G readiness: 5

Homegrown 5G: 4.5

Legacy Chinese equipment from 3G/4G: N/A

6

India

—

**Bumpy beginnings for
an Aatmanirbhar Bharat**



As with most emerging technology and 4IR sectors, the Indian strategy on 5G is underpinned by the drive for self-sufficiency. According to a report by the Department of Telecommunications of India, two of the country's three major priorities in 5G capacity-building are: Developing homegrown technologies and IP solutions in 5G; moving toward self-sufficiency; building semiconductor fabs, assembly and testing facilities.³⁷ A homegrown 5G vendor is in the works with Reliance Jio aiming to enter the 5G arena using its own technology.³⁸ Jio will reportedly be ready to start trials in 2021.³⁹ There has also been a revival of efforts to build semiconductor fabs in the country. Hindustan Semiconductor Manufacturing Co. (HSMC), which was positioned to set up the country's first semiconductor plant, abruptly withdrew its application in 2019, but there does appear to be a renewed push under Make in India and *Aatmanirbhar Bharat*.⁴⁰

The Government of India (GoI) initially granted Huawei and ZTE permission to participate in 5G trials.⁴¹ However, following a general backlash triggered by Chinese incursions in the Indian territory of Galwan starting May 2020, the GoI has barred state-owned telcos from using Chinese vendors. It stated further that it will “review the participation of all Chinese equipment makers in 5G trials”.⁴² It also appears likely that the GoI will use amendments to the General Financial Rules 2017 that restrict bidders from “nations [India] shares land borders with” due to national security



concerns. Thus, while not an explicit ban on Chinese vendors, the amendment, in effect, makes it much harder for a Chinese vendor to participate in the 5G bidding process.

Legacy networks, however, remain a challenge. Since in its initial stages, 5G services operate on existing 4G networks, telcos with existing Huawei and ZTE partnerships face an uphill battle. Airtel and Vodafone Idea have to cancel existing 4G contracts with Huawei and ZTE and BSNL's 3G network was built primarily with ZTE.⁴³

India's path to 5G has had far from a smooth start. A foundational element of 5G readiness is upgrading existing telecom infrastructure, including erecting cell towers—as 5G requires higher cell site density—and fiberisation. Currently, only 31 percent of cell sites are fiberised.⁴⁴ India's already ailing telcos face several short-term hurdles due to new restrictions on their existing Chinese partners. Vodafone Idea, which was preparing for a 5G bid, is likely on the verge of bankruptcy; and Airtel, among others, have raised concerns about the viability of India's 5G spectrum pricing.⁴⁵ In light of these factors, India is likely to be a late adopter of 5G, with limited commercial availability in late 2022, and nationwide deployment in 2025.

TIMELINE

August 2017: The Telecom Regulatory Authority of India (TRAI) released a Consultation Paper on spectrum auctions, which includes 5G bands.

September 2017: The government sets up 5G High Level Forum.

August 2018: TRAI released recommendations on 5G spectrum auctions; Department of Telecommunications mandates that these spectra should be “made available” for auctions; the 5G High Level Forum releases its report on ‘Making India 5G Ready’.

February 2019: TRAI released a White Paper on ‘Enabling 5G in India’ identifying infrastructure and regulatory requirements for 5G.

2021 (tentative): 5G Spectrum allocation and trials begin.

2022 (tentative): Commercial 5G networks come online.

PARAMETERS

National ban on Chinese vendors: No (soft ban)

5G readiness: 1.5

Homegrown 5G: Yes

Legacy Chinese equipment from 3G/4G: 3

7

Indonesia

—

**Island of progress in a sea
of complacency**



Despite the size of its market, the Indonesian government has shown little interest in pushing a 5G rollout. Some of this is due to the difficult island geography of the country which makes it time consuming and costly to lay cables and build infrastructure. But much of it is also related to what is seen as a lack of consumer demand for the new technology. In fact, Indonesia has yet to see a full 4G rollout in some parts of the country due to these same issues. This lack of interest has been particularly exemplified by the fact that the Indonesian government has yet to allocate enough spectrum for the 5G rollout.⁴⁶ Having opted to use the 3.5 GHz band currently reserved for satellite use, the government announced that it will take until 2024 for all the spectrum to be fully available for use in 5G networks (though they expect that the full rollout will begin in 2022).

There is one sector which has an interest in developing 5G in the country: Industrial producers who seek to use the massive increase in connectivity and improvement of speed to boost the efficiency of the manufacturing process and aid automation. Based on this interest, industrial companies began hosting 5G trials in 2017 and have been the drivers of progress since then.⁴⁷ The nature of these tests remains uncoordinated however, with each of the telecommunications companies in Indonesia developing their own infrastructure, which has led to worries about redundancy and wasted



investments. The Indonesian government has enthusiastically embraced Huawei's equipment as well as their ability to provide training for workers and improving general consumer awareness of the benefits of 5G.⁴⁸

TIMELINE

2017: Industrial trials for specific 5G applications begin.⁴⁹

August 2018: Indonesian company Telkomsel, in partnership with South Korean firm KT, hosted a 5G exhibition at the 2018 Asia Games.⁵⁰

October 2019: Communications Minister Rudiantara notes the lack of available spectrum for 5G development and that it will likely only become fully available in 2024.⁵¹

October 2019: Nokia completes first live 5G trial in Indonesia in partnership with local telecom provider Hutchison 3 Indonesia.⁵²

November 2019: Association of Indonesian Cellular Operators (ATSI) chairman Ririek Adriansyah announces that 5G services will begin implementation no later than 2022.⁵³

December 2020: Indonesia signs an MoU with Huawei to train 100,000 Indonesians in digital technology.⁵⁴

PARAMETERS

National ban on Chinese vendors: No

5G readiness: 2

Homegrown 5G: No

Legacy Chinese equipment from 3G/4G: 4

8

Japan

—

Steady and secure: Japan leads on 5G.



Bolstered by its private sector-led R&D prowess, Japan has been at the forefront of 5G innovation, with telcos like NTT Docomo beginning studies as early as 2010. By 2025, DOCOMO plans to expand its network to 97 percent of the populated areas of the country; Rakuten Mobile plans to expand its network to roughly 56percent of the populated areas of the country; Softbank plans to invest over US \$1.9 billion to expand its network to roughly 64 percent of the populated areas of the country; and KDDI plans to invest over US \$4 billion to expand its network to roughly 93percent of the populated areas of the country.⁵⁵

Many of Japan's leading telcos—Softbank, Docomo, and KDDI—partnered with Huawei for 5G trials; however, following a soft ban, all telcos have opted for non-Chinese 5G vendors.⁵⁶ Following pressure from the Trump administration, paired with Tokyo's own concerns regarding the dominance of Chinese 5G vendors, the Ministry of Internal Affairs and Communications put in place 'conditions' that effectively bar telcos from using network equipment from Huawei and ZTE. It mandated that telcos "take sufficient cyber security measures including responding to supply chain risk".



With their eye on the growing global 5G market, telcos are also entering strategic alliances to “challenge the dominance of foreign suppliers”. Telecom giants NTT and NEC, for instance, formed an alliance on the development of 5G and to develop 5G base station technologies.⁵⁷

TIMELINE

2010: NTT Docomo initiated 5G research and development, undertaking extensive indoor and outdoor field tests.⁵⁸

December 2012: NTT Docomo conducted the world’s first outdoor field experiment on transmission over frequency bands above 10 GHz.

May 2014: Docomo announced joint trials with Alcatel-Lucent, Ericsson, Fujitsu, NES, Nokia, and Samsung.⁵⁹

2017-18: Softbank and KDDI test and trial, in partnership with Ericsson, using 4.5 GHz bands; Docomo achieves 25-27 Gbps download speeds.

April 2019: Japan allocated spectrum to NTT Docomo, Softbank. Rakuten for a planned 2020 5G launch.

May 2019: US government restricts technology sales to Huawei Technologies, due to alleged security risks. Japan’s government follows suit and effectively bans China’s Huawei and ZTE from official contracts.

March-April 2020: KDDI, NTT Docomo, Softbank launch commercial 5G services.

2030: NTT Docomo aims for 6G launch by 2030.

PARAMETERS

National ban on Chinese vendors: No (soft ban)

5G readiness: 4.5

Homegrown 5G: Yes

Legacy Chinese equipment from 3G/4G: 2

9

Laos

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China goes all in on Laos



China's shadow—and therefore, Huawei's—looms large over landlocked Laos, sandwiched between Vietnam on its east, Cambodia on the south, Thailand and Myanmar on its western flank, and dominated by China on the north. Laos, one of the poorest countries in Asia, is leaning heavily on China's economic and technology power to get by. Laos has considerable debt repayments due in 2021 and is likely to receive the lion's share of lending and repayment extensions from China. Just to offer some context to China's dominance, Laos' entire electric grid has ceded control to a Chinese company.⁶⁰ In August 2016, one of Laos' telecom companies ETL Public Co handed over 51percent control to China's Jiafu Holdings.⁶¹ Laos' first ever smart expressway comes with the Huawei tag. Huawei collaborated with Yunnan Huayuan Electronics Co., Ltd. to build what it calls an "intelligent ICT platform" for the expressway. Huawei's data communication and transmission equipment are deployed along the route. In 2021, the country's planned 5G network is on track to be integrated with this smart expressway. Huawei is currently the third largest mobile vendor in Laos by market share.⁶² Samsung leads, with just short of 35 percent share. China is Laos' biggest foreign investor, pouring more than US \$12 billion across nearly 800 projects spanning special economic zones, industrial parks, and high-speed expressways.⁶³ Such is China's sway that Laos' job seekers are scrambling to learn Chinese as language proficiency emerges as a vital skill. Laos'



communist party supremo and Prime Minister Thongloun Sisoulith faces a delicate diplomatic brief as he rebalances between old friend Vietnam and strongman China which is increasingly underwriting the country's progress.

TIMELINE

August 2016: ETL Public Co handed over 51 percent control in August 2016 to China's Jiafu Holdings.⁶⁴

October 2020: Lao Telecom tested its 5G system for the first time, in preparation for a 2021 launch. Known plans include initial 5G services rollout in some Vientiane hotspots, the night street market along the Mekong River, Sailom village and the National University of Laos.⁶⁵

PARAMETERS

National ban on Chinese vendors: No

5G readiness: 2

Homegrown 5G: 0

Legacy Chinese equipment from 3G/4G: 5

10

Malaysia

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Setbacks and delays plague Malaysia's 5G rollout



Malaysia's journey toward 5G is off to a tumultuous start, with the 5G tender process facing a one- to two-year setback due to a hasty decision to allocate spectrum without due process. Nevertheless, bolstered by a comprehensive 5G strategy and an ambitious national fiberisation plan, the country is aiming for a full-fledged nationwide 5G network by 2024. The National Fiberisation and Connectivity Plan (NFCP) aims to improve connectivity, with a target of 30 Mbps speeds in 98percent of populated areas by 2023.⁶⁶ The Task force has also identified regulatory gaps, especially changing legislation to recognise telecom as a utility, thereby, removing several cumbersome bureaucratic permissions processes.

Malaysian leaders, like Singapore, have emphasised their own standards and needs over pressures from the United States. As former Prime Minister Mahathir Mohamad declared, “[Huawei] can spy as much as they like, because we have no secrets.” Malaysia has consistently refused to ban specific vendors from its 5G ecosystem. In an interview with Reuters, then Communications Minister Gobind Singh Deo said, “My position is very clear, we have our own safety standards, we have our own safety requirements...we have to be certain, and we have to be sure they meet the security standards that we have.”⁶⁷



”Existing contracts and legacy Chinese equipment have likely created path dependencies for Malaysian telcos. Altel, Maxis, Celcom, and Telekom Malaysia have partnered with Huawei for their 4G-LTE rollout.⁶⁸ Subsequently, most of the same vendors have signed MoUs with Huawei and or ZTE for 5G.⁶⁹

TIMELINE

November 2018: Malaysian Communications and Multimedia Commission (MCMC) established a National 5G Task force; announced 5G “Test Bed.”

July 2019: MCMC announced a call for proposals for “5G Demonstration Projects” to develop, test, and deploy 5G applications.

December 2019: National 5G Task force released its report, including an assessment of spectrum and physical infrastructure requirements. Recommended infrastructure sharing to reduce costs and a two-phase deployment.⁷⁰

February 2020: Malaysia joins GSMA 5G APAC Forum to Reinforce Regional Cooperation in Steering 5G Innovation.⁷¹

May 2020: Malaysia’s Communications Minister orders allocation of 5G spectrum to Altel Communications, Telekom Malaysia, Celcom Axiata, Maxis, and Digi.com, bypassing a tender process.

June 2020: Spectrum allocation decision nullified following backlash. Delayed to 2021.⁷²

2024: Target year for nationwide deployment of full use-case 5G.

PARAMETERS

National ban on Chinese vendors: No

5G readiness: 1

Homegrown 5G: No

Legacy Chinese equipment from 3G/4G: 4.5

11

Myanmar

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An urban phenomenon



Myanmar is being rocked by wave upon wave of multiple, violent crises. Yet, the country has made remarkable progress in telecom penetration. Barely 10 years ago, Myanmar had no 3G or 4G infrastructure in place. Today, more than 9 in 10 residents are within reach of a 3G signal and 3 in 4 are close enough to an LTE mobile broadband signal.⁷³ Myanmar has taken the first step in planning for the eventual implementation of fifth generation (5G) telecommunications services. More than 9 in 10 people in Myanmar have a mobile phone, active broadband subscriptions top 92 percent of the population but fast and reliable internet remains sketchy beyond the outer reaches of big cities. By late 2018, Norwegian telecoms operator Telenor partnered with Swedish telecoms equipment producer Ericsson and ran trials of its Internet of Things (IoT) technology on its network in Myanmar. Mytel, a joint venture between the Tatmadaw (Myanmar's military) and Vietnam's defence ministry, tested Huawei's 5G technology in August 2019. State-owned Myanmar Posts and Telecommunications (MPT) has also indicated readiness to jump in. The government is consulting on a limited rollout of 5G spectrum in 2020, while the major telecoms companies have been conducting preliminary technical research. In June 2019, the Ministry of Transport and Communications (MTC) issued a 5G focused consultation paper with notes on wireless spectrum allocation.⁷⁴ By then, the country's big telcos companies were already neck deep in feasibility studies



for 5G. Qatar-based Ooredoo tied up with China telecoms equipment manufacturer, ZTE, in May 2019 and went on to demo the technology.⁷⁵ Going by past trends and signals from the government, cutting edge technology upgrades like 5G are likely to be concentrated in a few urban hubs, exacerbating the digital divide. Myanmar's 5G goals are less about a dateline, more about testing 5G "sandboxes" rapidly to keep the country's markets competitive. Open-access, city-based 5G testbeds in Sweden (Urban ICT Arena) and Germany (5G Berlin) are used as examples, in Myanmar's 5G consultation paper.

TIMELINE

September 2018: Norwegian telco Telenor and Sweden's Ericsson ran trials of its Internet of Things (IoT) technology.⁷⁶

August 2019: Mytel, a military heavy Myanmar-Vietnam JV, tests Huawei's 5G tech.⁷⁷

May 2019: Ooredoo ties up with China's ZTE, goes on to demo 5G capability.⁷⁸

June 2019: Ministry of Transport and Communications (MTC) issues 5G focused consultation paper with notes on wireless spectrum allocation.⁷⁹

PARAMETERS

National ban on 5G vendors: No

Homegrown 5G: 0

5G readiness: >2.5

Legacy Chinese equipment from 3G/4G: 4

12

Philippines

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Archipelago as strategy



Philippines' telecom infrastructure has a mix of both Chinese and European technology. 4G is available now in most areas and 5G rollouts were just kicking off before the pandemic took hold. Mobile platforms and mobile broadband dominate fixed broadband penetration. There is a clear shift away from the US as the country's president Rodrigo Duterte is leaning on China for foreign direct investment flows essential for beefing up the country's infrastructure. In 2019, came China's first big blow to a long-standing telecom giant in the Philippines. China-owned Mislattel Consortium—now Dito Telecommunity Corporation—broke a duopoly between Philippine Long Distance Telephone Company (PLDT) and Globe Telecom, one of the country's largest network operators.⁸⁰ Around the same time, Globe Telecom began to rollout fifth generation (5G) services. Globe's technology comes from Huawei. Finnish telecom network equipment maker Nokia won an order from Globe Telecom to build a 5G network to the Philippines' second and third largest islands Mindanao and Visayas.⁸¹ Nokia will also upgrade the existing 4G network as part of the deal. Philippines' unique geographical feature - it is an archipelago between the Philippine Sea and the South China Sea, east of Vietnam - allows telcos more flexibility to navigate tricky political terrain like the current 5G flashpoint. Companies can tie up deals that balance strategic interests between China and say, Europe, like Globe is doing. Back in 2019, Globe Telecom in Philippines became the



first mobile operator in Southeast Asia to commercially launch 5G.⁸² By 2020, 5G for mobile was up and running. Globe has been aggressive and claims the widest 5G coverage in the country. Clearly, two themes are running in parallel: The Philippines, which has been a close ally of the US is now home to China's widening sway. Given the US view on China, Huawei's commercial involvement in the Philippines can potentially complicate the country's ties with America.

TIMELINE

October 2018: Globe Telecom gets Govt OK to deploy 5G small cells in Manila.⁸³

November 2018: China wades into the Filipino telecom market. The Department of Information and Communications Technology (DICT) names Mislattel-led consortium the "New Major Player (NMP)" in the local telecommunications market. Mindanao Islamic Telephone Inc. (Mislattel), Udenna Corp., Chelsea Logistics Holdings, and China Telecom.⁸⁴

May 2019: China Telecom formally signs agreement to create Mislattel, the joint venture that will become Philippines' third mobile operator.

June 2019: Globe officially launches 5G services in Manila.

November 2020: Globe expands 5G network to 17 key cities in populous areas of the National Capital Region (also known as Metro Manila), Visayas and Mindanao islands.⁸⁵

February 2021: Nokia lands a three-year 5G contract with the Filipino operator Globe Telecom to upgrade its current 4G network, as well as expand the geographical reach of its 5G network at more than 1,000 sites and the second and third-largest islands, Mindanao and Visaya.⁸⁶

PARAMETERS

National ban on Chinese vendors: No

5G readiness: >4

Homegrown 5G: No

Legacy Chinese equipment from 3G/4G: > 3

13

Singapore

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Ambivalence by design



Singapore is shaping up to be one of the early adopters of 5G in the region, with a handful of domestic telcos like Singtel, Starhub, and M1 leading the charge. 5G is part of the island nation’s ambitious vision for digital economy and governance, with pilot projects already underway on a variety of use cases, including automation of port operations, traffic management, maritime drones, and a host of 4IR solutions.⁸⁷

Singapore has remained ambivalent on the US–China contest over 5G, choosing instead to emphasise “security, resilience and performance” of 5G vendors. The country does not have an explicit ban on Chinese vendors. In a press briefing, Minister of Information and Communications S. Iswaran said, “Our [call for proposals] process did not exclude any vendor... the emphasis was on security, resilience and performance.”

Singapore’s two largest telcos—Singtel and Starhub-M1—have opted to partner with Ericsson and Nokia for 5G spectrum bids. TPG Telecom, which uses Huawei equipment, was not awarded a nationwide 5G license, and will “operate Singapore’s smaller [localised] 5G networks”. However, it should be noted that Singtel and Starhub-M1 have existing partnerships with Ericsson and Nokia respectively, which predate Huawei’s embroilment in the US-China geopolitical contest.⁸⁸ Additionally,



M1 and Starhub have also partnered with Huawei on their 4G network, and the former has cooperated with the Chinese vendor on wireless network technology since 2008.⁸⁹

Singaporean telcos will aim to deploy standalone 5G networks, 5G connectivity built on 5G-specific infrastructure, in January 2021. Singaporean is aiming not just for high-speed, low latency networks, but to facilitate MMTC capabilities for IoT applications and beyond, with nationwide availability by 2025.⁹⁰ In September 2020, IMDA launched the 5G Living Lab to enable businesses to develop and test 5G-enabled devices and applications. IMDA will also be undertaking partnerships to “nurture a pipeline of 5G-ready workforce across the telecom sector and the wider 5G ecosystem”.

TIMELINE

May 2017: Singapore’s Infocomm Media Development Authority (IMDA) issues a public consultation paper on key 5G mobile technology developments and spectrum requirements.⁹¹

November 2018: Telco Starhub, in partnership with Nokia, successfully completes outdoor 5G pilot.⁹²

May 2019: IMDA releases the Second Consultation on 5G Mobile Services and Networks,⁹³ setting out Singapore’s overall 5G vision and strategy, and proposes regulatory frameworks to facilitate the deployment of 5G networks.

April 2020: IMDA awards spectrum licenses for nationwide networks to Singtel and Starhub-M1 joint venture. TPG Telecom awarded a license for localised 5G networks.⁹⁴

2025: Target year for nationwide networks with full-fledged 5G capabilities.⁹⁵

PARAMETERS

National ban on Chinese vendors: No

5G readiness: 3.5

Homegrown 5G: No

Legacy Chinese equipment from 3G/4G: 2.5

14

South Korea

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**“Shrimp among whales”
South Korea forges its
own path**



In April 2019, South Korea rolled out the world's first countrywide commercial 5G network, the culmination of an impressive track record that began with the announcement of a 5G roadmap in 2014. South Korea's harmonised approach with partnerships between government and the private sector from the early stages has given the country a major advantage. Furthermore, an agreement between South Korean carriers in 2018 to build a single 5G network will save telcos an estimated US \$938 million and will reduce redundancies in terms of 5G cell sites.⁹⁶ According to some studies, South Korea will achieve 90 percent 5G penetration by 2026.⁹⁷

Bolstered by its robust R&D capabilities, spearheaded by Samsung, South Korean telcos have opted primarily to work with domestic 5G vendors. Samsung Electronics supplies 5G equipment to South Korea's largest telcos carriers, SK Telecom, and KT, and Huawei currently supplies less than 10 percent of the 5G equipment used in the country.⁹⁸

At the same time, South Korea has consistently refused to ban Huawei and ZTE, despite US pressures. This is likely because South Korean telcos have a mutually beneficial relationship with Chinese vendors. Samsung, for instance, has operation Xian, China with two fabs logic gate flash memories and other 5G equipment, which



it supplies to Huawei. Huawei meanwhile established its Korean unit in 2007, opened a 5G lab in the country in May 2020 and has also signed a deal with the Korean AI Association to support local AI startups.⁹⁹ A representative from LG Uplus, currently the sole telco deploying Huawei 5G equipment, stated, “Security issues are just an excuse for the US, and telecoms in weaker countries are collateral damage in its hegemonic struggle with China.”¹⁰⁰

Huawei equipment was used by LGU+ for its 4G LTE networks in Seoul and Gangwon.¹⁰¹ A report by a South Korean think tank called to attention the fact that in the transition phase, 5G services operate on existing LTE networks, which provides an explanation as to why LGU+ remains the only South Korean telco working with Huawei for its 5G networks as well.¹⁰²

The world is looking to the deployment of 5G in South Korea as an important precedent. South Korean consumers are at the frontline of experiments in the new kinds of content 5G enables, including Virtual Reality (VR) and Augmented Reality (AR) applications and cloud gaming. Additionally, South Korea’s strengths in R&D and industrial applications of 5G position it as a leader in the IoT space.

TIMELINE

February 2014: Ministry of Science, ICT and Future planning announced 5G roadmap, with a December 2020-deadline for rollout. Government commits KRW 1.6 trillion (US \$1.5 billion) for 5G.¹⁰³

December 2017: Roadmap for 5G commercialisation.

February 2018: 5G trials by KT Corp at the Winter Olympics in Pyeongchang¹⁰⁴

June 2018: Frequency bidding begins. Government allocates 280 MHz of spectrum (from 3.4-3.7 GHz band) for 3.3 trillion KRW and 2400 MHz of 28 GHz spectrum.

April 2019: World’s first countrywide commercial rollout (Samsung, SKT, KT, LG Uplus).

2026: Aim to achieve KRW 180 trillion (US \$160 billion) in production related to 5G industries and capture 15 percent of the global 5G allied market.

PARAMETERS

National ban on Chinese vendors: No

5G readiness: 4.5

Homegrown 5G: Yes

Legacy Chinese equipment from 3G/4G: 3

15

Taiwan

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**Taiwan leads on
“Clean Networks”**



Taiwan identified the threat from deploying communications networks on Chinese infrastructure early on, restricting vendors like Huawei and ZTE from 4G networks since 2014. Audrey Tang, Taiwan’s Digital Minister warned, “There’s no such thing as pure private companies in China. From the perspective of the PRC, the ruling party can change your leader whenever the situation is intense.”¹⁰⁵

Taiwan’s top telcos have all opted to work with non-Chinese vendors, including Ericsson and Nokia, for their 5G rollouts. The island nation successfully began its commercial 5G rollout in July 2020, within its projected timeframe, and by the end of 2020, 5G subscribers had already hit the 1 million mark.

The Taiwanese government’s active and substantial investment in 5G supported a lightning-fast rollout. Telco service providers have reported that their coverage has reached 50 percent of the country’s cities, and some of the largest providers—Chunghwa Telecom, Far EastOne and Taiwan Mobile—are aiming to build 7000 5G base stations by 2022.¹⁰⁶ In the longer term, budding collaborations with international partners like Qualcomm and SK Telecom will be crucial in building a vibrant 5G ecosystem, and a wide array of commercial offerings.



TIMELINE

2013: Executive Yuan Office of Science and Technology presents blueprint for 5G development in Taiwan. 5G rollout target set for 2020.¹⁰⁷

January 2014: 5G Development Strategic Review Board Meeting held.¹⁰⁸

April 2019: Executive Order bans Taiwanese government agencies from using telecom services and equipment from “dangerous countries”, including China.

May 2019: 5G Action Plan approved, with funding of USD 655 million over four years.¹⁰⁹

June 2019: Qualcomm begins construction of Hsinchu Science Park, a research, testing and manufacturing centre for 5G.¹¹⁰

June 2020: First 5G license issued by the government of Taiwan, to Chunghwa Telecom, followed shortly by all other major telcos.¹¹¹ Nokia wins exclusive 5G contract with Taiwan Mobile.¹¹²

July 2020: Commercial rollout of 5G services begins.

August 2020: US–Taiwan on declaration on 5G security and cooperation under US 5G Clean Networks.¹¹³

September 2020: All five major Taiwanese 5G telcos (Chunghwa Telecom, Far EasTone, Taiwan Mobile, Taiwan Star, and Asia Pacific Telecom) receive “Clean Network” status from the US State Department.

PARAMETERS

National ban: Yes **5G readiness:** 4 **Homegrown 5G:** No

Legacy Chinese equipment from 3G/4G: 0

16

Thailand

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**Transforming Thailand
into the Gateway to Asia**



In 2016, the Thai government adopted “Thailand 4.0”, a 20-year strategy to modernise and digitise Thailand’s economy. The centrepiece of this strategy is the Eastern Economic Corridor (EEC), an initiative encapsulating digital infrastructure, urban development, industrial development, and human resource development.¹¹⁴

Huawei has been deeply involved in Thailand’s digital transformation, from planning, skilling, and R&D to sectoral applications of 5G. The Thai government’s 2017 White Paper, “Insights on Digitalization of Thailand Industry”, a comprehensive roadmap for the country’s future economy, was designed in partnership with Huawei.¹¹⁵ In October 2020, Huawei signed an MoU with the Thai government for the setting up of a Huawei Academy for ICT skills training.¹¹⁶ Finally, in terms of specific 5G applications, the National Broadcasting and Telecommunications Commission (NBTC) have partnered with Huawei and Siriraj Hospital to test a driverless vehicle for the provision of medical supplies, using 5G.¹¹⁷

Thailand’s telecom sector is dominated by three major operators: Advance Info Service (AIS), DTAC, and Truemove. Two state-owned enterprises also operate in the country, though their collective market share is less than 1 percent: CAT Telecom and TOT Public Company Limited (TOT).¹¹⁸ All these operators have signed R&D MoUs



with a combination of Nokia, Ericsson, Huawei, and ZTE. Japan's NTT Docomo has also announced that it is establishing a 5G consortium, starting with Thailand, with plans to expand to the rest of the Asia-Pacific region.¹¹⁹

TIMELINE

November 2018: Ministry of Digital Economy and Society announces 5G testbed in Chonburi, backed by a technology alliance consisting of Huawei, Ericsson, Qualcomm, Intel, Nokia, and other local telecom operators.¹²⁰

February 2019: Chonburi testbed officially launched.¹²¹ 5G trials begin.¹²²

February 2020: 5G spectrum allocation concludes.¹²³ AIS launches its commercial NSA 5G services, becoming the first provider in Thailand to offer 5G.

August 2020: AIS reaches nationwide rollout. AIS announces that it has expanded its 5G network to all 77 provinces, with 100 percent coverage in EECs.¹²⁴

2022: Thailand's second-largest telco, DTAC, to launch 5G in 2022.

PARAMETERS

National ban: No **5G readiness:** 5

Homegrown 5G: 0

Legacy Chinese equipment from 3G/4G: 4.5

17

United States

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The art of 5G war



5G has emerged as a new frontier for US–China rivalry, which saw the most dramatic escalation in the summer of 2020. At the time, the US was leading a worldwide campaign to convince foreign governments, particularly those in allied nations, to bar Chinese 5G from their telecommunications networks, arguing that allowing them into those systems would lead to violations of their citizens’ privacy and give China undue influence over their actions. With a new administration in place, Huawei is seeking extra time to appeal last-minute Trump policies designed to reduce its sway in the US. Questions continue to swirl around Biden’s approach and whether there is political will to change course. In 2018, the US Federal Communications Commission rejected nationalising the country’s 5G network, saying that “the market, not government, is best positioned to drive innovation and investment.”²⁵ There remains confusion about whether the plan was to nationalize the infrastructure or just have a nationwide network where bandwidth can be sold to retail customers. The central question was the same that animates the current debate: How do we ensure that industry, while chasing quarterly profits, builds, and secures the system?



The Donald Trump administration spearheaded the campaign against Chinese 5G vendors Huawei and ZTE. For 12 months between 2019 and 2020, before the coronavirus pandemic began its deadly march, the United States unleashed a steady string of escalations against China's Huawei, the world's largest telecoms supplier, describing the company as Beijing's backdoor access to foreign markets and an "unacceptable" risk to national security, critical infrastructure, privacy, and human rights.

The US claims "trust cannot exist" in Huawei because the company is subject to "secret manipulation" by the government of China. Technical fixes, in the US view, will not cut the risk of allowing Huawei's and ZTE's equipment anywhere in 5G network infrastructure. It is instead openly batting for Sweden's Ericsson, Finland's Nokia, South Korea's Samsung, and a long line of other "clean telcos" and courting the world's leaders to switch off Huawei.

The US sees Huawei, the world's largest telecom equipment company, as an arm of the Chinese Communist Party's surveillance state, and therefore, a conduit to sabotage. The US Justice Department has indicted Huawei for stealing US technology among a long list of other charges. In May 2019, America locked out Huawei from procurement of American components which are crucial to its bestselling 5G product line. Yet, suppliers found workarounds. They began selling Huawei goods which were made outside the US. So, the latest efforts by the American government, which came in August 2020 seeks to seal that leak. The US Commerce Department confirmed rules that will bar companies from using US technology (software or hardware) in making processor chips and other components based on Huawei specifications.¹²⁶ All the pieces are being carefully stitched together with duct tape and string. The US is not limiting its blow to 5G hardwiring alone, the hammer has come down on wildly popular Chinese apps as well. In the early hours of 18 September 2020, the US announced bans on WeChat and TikTok too, citing national security. The US effort has been to build a shared opposition to China and the results, on predictable lines, have been mixed. Many countries have tried to lie low and reduce supply chain dependence on China.

The US view is clear: "Telecommunications companies around the world should consider themselves on notice: If they are doing business with Huawei, they are doing business with human rights abusers." The American counter charge is built on 5 pillars: Clean communication, collaboration, Washington's investment in the success of non-Chinese telecom companies, igniting investor interest in do-ability, and not punishing legacy networks who got wedded to Huawei in a more innocent



world.¹²⁷ The United States does not yet have a homegrown competitor on Huawei's scale, although Cisco and Qualcomm together make 5G compatible chips, switches, and routers. Europe's Ericsson and Nokia are the beneficiaries of countries turning away from Huawei.

TIMELINE

October 2018: Verizon begins 5G rollout in four US markets for fixed wireless access.¹²⁸

April 2019: US, including 31 other countries agree on 5G Security, in Prague

April 2019: Verizon begins 5G rollout for mobile.

May 2019: US places Huawei on Entity List¹²⁹ in attempt to lock out Huawei from procurement of American components crucial to its product line.

May 2019: US President Donald Trump signs executive order empowering the Commerce Department to prohibit U.S. firms from purchasing foreign-manufactured telecommunications equipment.¹³⁰

March 2020: US releases 'National Strategy to Secure 5G', trains guns on high-risk vendors.

April 2020: Five US telecoms operators have launched 5G services.

June 2020: Mike Pompeo warns of Chinese 5G, says "tide is turning" towards trusted 5G vendors.

June 2020: US announces Clean Network which includes a group of "clean" telcos by name.

August 2020: US further restricts Huawei access to US technology alternative chip production and provision of off-the-shelf (OTS) chips produced with tools acquired from the United States.

August 2020: US completes first 5G mid-band spectrum auction.

2021-22: Expected timeline for full commercial 5G rollout.

PARAMETERS

National ban on Chinese vendors: Yes

5G readiness: >4

Homegrown 5G: No

Legacy Chinese equipment from 3G/4G: ~2.5

18

Vietnam

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**Vietnam’s “quiet ban”
strikes a fine balance**



Vietnam has outlined its ambition to become ASEAN’s leading digital economy in its National Digital Transformation Roadmap 2025 and Vision Toward 2030, which Prime Minister Nguyen Xuan Phuc approved in June 2020.³² High-speed connectivity is a crucial element of all three pillars of the Roadmap, namely e-government, e-economy, and e-society. The Roadmap lays out goals to increase fibre-optic internet coverage to 80 percent by 2025, and for nationwide 5G deployment.

Although the pandemic has delayed the 5G deployment timeline, Vietnam’s telcos are gearing up for a commercial rollout in 2021. Vietnam’s largest telco, state-owned Viettel, has also claimed that it is working on its own indigenous 5G equipment.¹³³

Vietnam’s major telcos have all chosen to collaborate with non-Chinese 5G vendors. As Viettel’s CEO Le Sang Dung said to reporters, “We are not going to work with Huawei right now...It’s a bit sensitive with Huawei now. There were reports that it is not safe to use Huawei. So Viettel’s stance is that, given all this information, we should just go with the safer ones. So, we choose Nokia and Ericsson from Europe.”¹³⁴



Some analysts see Vietnam’s “quiet ban” as an attempt to strike a balance between its souring security relations with Beijing—particularly in the South China Sea—and warming ties with Washington on the one hand, and its economic and investment ties with China on the other.¹³⁵ Vietnamese companies are also—quietly—working to secure 5G supply chains. Notably, the country’s largest conglomerate, Vingroup has signed a deal with Qualcomm and Fujitsu Ltd. to produce 5G smartphones domestically.¹³⁶ Vietnam is, therefore, somewhat of an outlier in a region that has otherwise embraced Huawei and ZTE.

TIMELINE

June 2020: The Vietnamese government adopts the Digital Transformation Roadmap 2025 and Vision Toward 2030.

December 2020: Viettel begins 5G commercial trials.

2021: Projected commercial rollout.

PARAMETERS

National ban: No

5G readiness: 3

Homegrown 5G: No¹³⁷

Legacy Chinese equipment from 3G/4G: 3.5?



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