



5G Made by America

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Introduction

To date, warnings by Donald Trump's administration directed at allies all over the world since 2018 with regard to fears that they would be building 5G networks using components from the People's Republic of China (PRC), dominating the public debate in 2019, have failed to translate in 2020 to unambiguous investment decisions to the extent which the Americans would expect – namely, the outright exclusion of Chinese vendors. De facto only four countries that are important in terms of US alliances adopted a not only political but also regulatory position that is unambiguous. Australia, New Zealand, and Japan closed off their telecommunications networks to PRC components completely, and Great Britain announced the same.¹ Hence, many experts have pointed to the need to add to inefficient American arguments of a political nature (which from May 2019 have encompassed legislative measures as well, for instance putting Huawei and its business partners on the Entity List or severe restrictions on 5G CPU sales to Huawei imposed on de facto all manufacturers that use American components) the ones which fit the American way of thinking about transforming the world through a positive agenda, that is **provide new and innovative solutions**. In this particular case the solutions which would actually be competitive with Chinese 5G technology manufacturers. **OpenRAN can be such a positive argument.**

1 Many countries signed political declarations with the US, however, that express their will to cooperate in ensuring 5G network security, including Poland, Latvia, Romania, Czechia, Estonia, Slovenia. Steps towards restricting market access owing to security criteria have been announced by France and can be expected from India.

At the same time, the “geotechnology” rivalry among the great powers – primarily, but not solely, related to 5G network development – has accelerated over the last months. What is meant here is not the dictionary meaning² of geotechnology, but one not yet widespread in Polish (which in itself is proof positive of insufficient level the debate and awareness regarding this topic has in Poland), which is to do with the influence of technology on power projection and building geopolitical and geoeconomic advantages by states.³

Experts claim that in the 10- to 15-year horizon PRC, considered the systemic rival by the European Union,⁴ may get ahead of the US in the strategic race for developing and implementing key technologies, doing so in a model that does not promote EU-backed democratic values. Among the technologies, apart from 5G (which in fact will largely be instrumental in their progress), artificial intelligence or quantum computing can be mentioned.⁵

2 “Geotechnologia” in *Słownik języka polskiego*, <https://sjp.pl/geotechnologia>, [online: 4.05.2020]; cf. “geotechnology” in Merriam-Webster, <https://www.merriam-webster.com/dictionary/geotechnology>.

3 Cf. Stephen R. Nagy, “Geotechnology meets geopolitics: US-China AI Rivalry and Implication for Trade and Security”, *World Commerce Review*, 2018.

4 As the document *European Commission and HR/VP contribution to the European Council: EU-China – A strategic outlook* puts it, “China is, simultaneously, in different policy areas, a cooperation partner with whom the EU has closely aligned objectives, a negotiating partner with whom the EU needs to find a balance of interests, an economic competitor in the pursuit of technological leadership, and a systemic rival promoting alternative models of governance”, <https://ec.europa.eu/commission/sites/beta-political/files/communication-eu-china-a-strategic-outlook.pdf>, p. 1.

5 Martijn Rasser, “Countering China’s Technonationalism”, *The Diplomat*, <https://thediplomat.com/2020/04/countering-chinas-technonationalism/>, [online: 4.05.2020].

Status quo of 5G in the US and future plans

In the case of the new-generation network, variables for assessing forecasts of how the said rivalry develops are numerous, one of them being the number of base stations. In this aspect, on the one hand, the PRC has left the US behind by 85 thousand stations (100,000 in the PRC vs 15,000 in the US) and Beijing's plans involve spending USD 1.4 trillion to finance the country's technological development until 2025, including 5G bases stations (for the modest sum of USD 35 billion);⁶ on the other hand, the US is now passing the so-called Sputnik moment and trying hard to launch systemic support of technology and 5G network development along with regulatory reins for Chinese worldwide expansion.⁷ In terms of technological advances for American 5G success, several are going to be pivotal: OpenRAN, creating software-defined virtualised networks, and cloud computing.⁸ The US can also count on American visionaries such as Elon Musk. His company, SpaceX, is rolling out a 5G-enabled satellite internet project, after all,⁹ and even if the project seems "from outer space" now, Starlink communication satellites are already zipping in orbit, with engineers racking their brains for a way to lower the latency and increase the efficiency of such a network.¹⁰ Jeff Bezos's company, Blue Origin, offers similar vistas as part of its Kuiper project that plans to have Internet coverage of 95%

6 "China's Got a New Plan to Overtake the U.S. in Tech", Bloomberg, <https://www.bloomberg.com/news/articles/2020-05-20/china-has-a-new-1-4-trillion-plan-to-overtake-the-u-s-in-tech>, [online: 4.05.2020].

7 An earlier attempt at blunting [PRC power], which made it illegal to sell American-made components to Huawei, including advanced computer chips on which the Chinese firm relies, was not the knock-out blow the White House hoped it to be. Chipmakers were able keep shipping Huawei semiconductors from factories outside America. So on May 15th the Trump administration extended its restrictions from chips to the tools used to make them—many of which come from America. So long as big microprocessor producers, like Taiwan Semiconductor Manufacturing Company (TSMC), use American-made equipment, they will no longer be able to forge Huawei-designed chips anywhere in the world." More: "America's latest salvo against Huawei is aimed at chipmaking in China", The Economist, <https://www.economist.com/business/2020/05/21/americas-latest-salvo-against-huawei-is-aimed-at-chipmaking-in-china>, [online: 24.05.2020].

8 Shane Tews, "Virtualized networks and O-RAN will be key for American 5G success", AEIdeas, <https://www.aei.org/technology-and-innovation/virtualized-networks-and-o-ran-will-be-key-for-american-5g-success/>, [online: 21.05.2020].

9 At the moment, satellite internet is primarily used for military purposes. Still, it is pursued for civilian goals not only within Starlink but also by Britain's OneWeb.

10 The plans, albeit highly controversial, are very ambitious and involve placing over 42,000 satellites altogether to make 1 Gbps internet available in every nook and cranny of the globe, especially in spots that traditional telecom providers have trouble covering. Federal Communications Commission gave SpaceX permission to position as many as one million antennas on the ground, needed to connect users to the Starlink satellite network. More: Michael Sheetz, "FCC approves SpaceX to deploy up to 1 million small antennas for Starlink internet network", CNBC, <https://www.cnbc.com/2020/03/20/fcc-approves-spacex-to-deploy-1-million-antennas-for-starlink-internet.html>, [online: 24.05.2020].

of our planet using 3,236 satellites.¹¹ Mark Zuckerberg's Facebook via its Connectivity Lab, is also betting on advanced telecom innovations, including laser beams.¹²

Let's come back to earth, though, and point out an example of responding to the "5G challenge" which is the American administration's systemic support for developing this technology. It aims to create other technology solutions that are more traditional when compared to the cosmic ones above and that could in the coming years form a rampart to stem the tide of Chinese companies, mostly Huawei and ZTE.

In this aspect, 2020 began on 14 January, namely on the day when two US senators introduced the Utilizing Strategic Allied (USA) Telecommunications Act, a bipartisan bill supported by lawmakers in charge of Senate Committee on Intelligence.¹³ Thus, Richard Burr and Mark Warner backed the market trend related to a new way of thinking about the 5G architecture. However, this action can be viewed in a broader context as an attempt to deploy new strategic approach to building the US's geopolitical advantage in the world increasingly depending and relying on ICT and its suppliers.

The Act proposes setting up an R&D fund to boost research and commercial use of its results in the following domains:

- promoting technology development, including software, hardware, and microchip technology to increase US competitiveness in 5G supply chains and subsequent wireless technologies;
- speeding up the buildout and deployment of compatible, interoperable, open interface standard-based equipment such as devices developed according to the standards defined by O-RAN Alliance, Telecom Infra Project, 3GPP, O-RAN Software Community, and the like, or any organisations that will take their mantle;
- promoting the compatibility of new 5G equipment and future interoperable open standards-based devices; managing the integration of network environments from numerous providers; objectively defining the criteria to certify equipment as conforming to open interoperability standards;

11 Tomasz Domański, "Amazon nie chce być tylko największym sklepem, ale również największym dostawcą satelitarnego internetu", SpidersWeb, <https://www.spidersweb.pl/2019/04/project-kuiper-amazon-internet-satelite.html>, [online: 24.05.2020].

12 Connectivity Lab, <https://info.internet.org/en/story/connectivity-lab/> [online: 25.08.2020].

13 "National Security Senators Introduce Bipartisan Legislation to Develop 5G Alternatives to Huawei", <https://www.warner.senate.gov/public/index.cfm/2020/1/national-security-senators-introduce-bipartisan-legislation-to-develop-5g-alternatives-to-huawei>, [online: 7.05.2020].

- advancing the development and inclusion of security functionalities which increase equipment integrity and availability in many-vendor networks; advocating the use of network-function virtualisation to make cooperation of numerous vendors easier and their market more diversified.¹⁴

Against the backdrop of US-PRC strategic competition, this new approach to 5G building model, i.e. OpenRAN, is promoted and supported domestically, but it is also meant to be exported to like-minded countries.

That is why the legislation proposed in the Senate envisages not only setting up the **Public Wireless Supply Chain Innovation Fund** to the tune of USD 750 million,¹⁵ but also establishing the **Multilateral Telecommunications Security Fund** worth USD 500 million and governed by the Secretary of State. The legislation is still being discussed, but America is already sending signals to the market and her allies about the willingness to open (pun intended) anew the cooperation on OpenRAN technology and 5G development. The draft Act assumes that State Secretary in collaboration with Assistant Secretary of Commerce for Communications and Information, Secretary of Homeland Security, Secretary of the Treasury, Director of National Intelligence, and Federal Communications Commission shall establish a common financing mechanism in coordination with foreign partners to foster the development and adoption of secure and trusted telecommunications technologies.¹⁶ Whether we should interpret the announcement after the Saturday, 15 August official visit by State Secretary Mike Pompeo in Warsaw in this light, we'll probably know soon. Polish government spokesperson Piotr Müller hastened to assure those listening that "Poland is ready to commit to such cooperation with American companies but also with European companies that are going to cooperate in terms of this topic and with other global enterprises that will assure proper information security conditions, infrastructure security ... in this crucial domain of technology development." For his part, Pompeo declared that the discussion on 5G technology would continue.¹⁷

OpenRAN falls squarely into a wider debate on diversifying and securing 5G supply chain. It also appears that regulatory bodies and governments, not only in the US but also in Europe, consider OpenRAN development more

and more seriously, especially since, in many countries that represent big markets for telecom solutions, political difficulties related to defining the role of Chinese suppliers in 5G networks have been visible for months.¹⁸

To riff off the title of this brief, OpenRAN component and technologies are not only made in America. OpenRAN DNA allows technology suppliers from various countries to be inserted into the supply chain. That is why this technology is also regarded as an opportunity for firms that offer technology solutions from, in fact, the world over. And the fact that OpenRAN started to be endorsed and developed in the US means that Americans comprehend the dire need to make up for the lost time and to approach 5G building in a new way, one that would situate the US better in the value chain of this technology.

OpenRAN history or software, stupid

American experts indicate that Americans can only win the 5G race if they "act quickly to unleash U.S. innovators ... and place the national interest first", as they did in the "Sputnik moment" in the late 1950s during the space race against the USSR.¹⁹ Such a stance should inform the US administration's actions in its cooperation with American tech business so as to gain advantage in the global race to develop new and disruptive technologies. One reason for the US falling behind with regard to the PRC in some areas of technology was insufficient emphasis on unfolding the third technological offset, planned as early as 2014 in the Defense Innovation Initiative framework. This was the exact moment when the PRC was preparing the tech manifesto *Made in China 2025*, unveiled in 2015, and making strides in modernising its armed forces under the military-digital fusion programme. The second important reason for innovation loss was the lack of strategic cooperation with Silicon Valley tech giants. This process has been illustrated in a 2016 conversation, recently plucked from obscurity by *The New York Times*, between Gen. Raymond Thomas and Eric Schmidt, wherein the chairman, now former, of Google, points out to the general (in his typical very frank way) how meagre the US Army progress in deploying machine learning is, as he says he could, taking into account the dynamic of global tech companies, alter this perilous situation if put "under [his] tent for a day".²⁰ A day or even a year

¹⁴ Ibidem.

¹⁵ On 24 April, similar draft legislation was presented in the House, likewise in the bipartisan configuration; it stipulates the establishment of Wireless Supply Chain Innovation Grant Program.

¹⁶ A bill to use proceeds from spectrum auctions to support supply chain innovation and multilateral security, <https://www.congress.gov/bill/116th-congress/senate-bill/3189/text>, [online: 8.05.2020].

¹⁷ Marek Jaślan, "Polskie rozmowy z sekretarzem stanu USA o 5G na razie bez konkretów", <https://www.telko.in/polskie-rozmowy-z-sekretarzem-stany-usa-o-5g-na-razie-bez-konkretow> [online: 15.08.2020].

¹⁸ Neal Doran, "Vodafone takes seat on Open RAN policy board", <https://www.telcotitans.com/vodafonewatch/vodafone-takes-seat-on-open-ran-policy-board/1665.article>, [online: 21.05.2020].

¹⁹ Richard Weitz, "America's Sputnik moment on 5G", <https://thehill.com/opinion/cybersecurity/481236-americas-sputnik-moment-on-5g>; Steve LeVine, "Dysfunctional U.S. needs 'Sputnik moment' on future tech", <https://www.axios.com/geopolitics-technology-geotechnology-china-us-b5fe441f-b776-4194-995b-a4d7345099bf.html>, [online: 07.05.2020].

²⁰ Kate Conger, Cade Metz, "'I Could Solve Most of Your Problems': Eric Schmidt's Pentagon Offensive", *The New York Times*, <https://www.nytimes.com/2020/05/02/technology/eric-schmidt-pentagon-google.html>, [online: 04.05.2020].

would surely not be enough, but such cooperation is necessary to keep the US technologically competitive.

Many US technological innovations, starting with the Internet itself, originated in the modernisation and development needs of the American armed forces and were tied to international rivalries. Likewise with 5G, possibly, in light of its military dimension and the strategic importance of this network both for hostilities (hybrid warfare) or intelligence information exchange and for extending the very scope of cyberattack-vulnerable infrastructure.

Meanwhile, 5G network development (not to mention the actual technology) has only featured among US Department of Defense priorities since 2019, as Michael Griffin, former Under Secretary of Defense for Research and Engineering, admitted.²¹ The technology has not progressed in the civilian domain, either. As they kept benefitting from the 4G/LTE development phase, American companies slept through the moment or took poor business decisions. This resulted in not a single American company being present among torchbearers of 5G end-to-end supply, that is the “5G Big Four” which includes Ericsson, Huawei, Nokia, and Samsung.

Eric Schmidt, mentioned before, and his understanding of US technological advantages in innovative software solutions is one way out for America running late to leap ahead in the 5G rivalry with the PRC. Eric Schmidt believes in the power of software and in the need to develop American software-producing companies in many domains: defence, e-mail communication, human capital management systems, intelligence information exchange, and military systems among them. And it’s hard to disagree with him: as of now, US technological power lies not in the hands (and funds) of DoD and DARPA but in advantages, innovative way of thinking, and restless activity of Silicon Valley, full of actors the American government has to find synergy in cooperation with, otherwise it’s poised to lose its global supremacy. Silicon Valley, for its part, lives and breathes software.

What is OpenRAN

Currently, if a carrier wishes to buy telecommunication equipment, it is often constrained to Big Four companies only. In practice, the number of suppliers in the US, as Huawei is excluded, equals three. As for Samsung, it is not present with its 5G solutions in all the world’s countries. Thus, OpenRAN approach aims to increase the number of so-called telecom

21 Cf. Mike Dano, “DoD Begins Testing 5G With \$52M Budget”, [https://www.lightreading.com/mobile/5g/dod-begins-testing-5g-with-\\$52m-budget-/d/d-id/754272](https://www.lightreading.com/mobile/5g/dod-begins-testing-5g-with-$52m-budget-/d/d-id/754272), [online: 04.05.2020] and Jackson Barnett, “DOD establishing a director role to lead 5G development”, <https://www.fedscoop.com/5g-assistant-director-and-initiative-dod/>, [online: 04.05.2020].

solution providers which can provide various network-building components from general-purpose hardware to software-defined technology, encompassing RAN, or Radio Access Network, in particular, which is made up of such devices as mobile transceivers, towers, masts that connect users and wireless equipment with the network at large. In other words, the OpenRAN standard introduces a split between hardware and software origin at the level of radio networks, or base stations, and core network, or the operator’s backbone network, and plays up open software and open interfaces.²²

It is worth stressing that software solutions are progressively more important part of modern telecommunications networks and play a major role in 5G development as they provide new network solutions which can offer improved speed, cost, and security. And that is OpenRAN’s largest innovative added value. Open virtualised RAN architecture is based on cloud solutions and will in the years to come help create more innovative, trouble-free, and efficient network environment. This is the necessary condition to effectively provide apps and services via a 5G network.²³ The 5G formula with this new American twist is therefore a “mix and match, software-forward approach”.²⁴ It is meant to split the RAN layer into both hardware and software components, and let these components be built by American or Western innovators and then be deployed by telecoms as they are rolling out the 5G network.

So do OpenRAN creators see their advantages, and their endorsers within the business and public sectors in the US do, too.

Since the year started, we are witnessing tangible action on the US’s part with forward-looking OpenRAN model-based 5G technology development as its aim as well as with plans to build the new-generation network following this model in the future. Yet, it should be noted that currently Ericsson, Samsung, and Nokia are in the lead as regards 5G development in the US, and it is the cooperation with these trusted telecommunications service providers that will prove crucial in the first stage of 5G deployment.

The third of these companies is smashing world records on the American market. In May 2020, a wireless 5G network built in Texas turned out to be the fastest across the globe, reaching 4.7 Gbps. Using the 800 MHz band and the Dual

22 Andrzej Miłkowski, “Rynek producentów platform telekomunikacyjnych dla sieci komórkowych 5G to szansa rozwoju dla polskich firm programistycznych”, <https://prostobezposrednio.pl/blog/polscy-programisci-5g/>, [online: 24.05.2020].

23 “VMware, Intel i Deutsche Telekom testują otwartą chmurową platformę vRAN”, <http://www.virtual-it.pl/10129-vmware-intel-i-deutsche-telekom-testuja-otwarta-chmurowa-platforme-vran.html>, [online: 07.05.2020].

24 Sean Kinney, “Should the US invest in open RAN or just buy Nokia or Ericsson?”, RCR Wireless News, <https://www.rcrwireless.com/20200210/network-infrastructure/us-invest-open-ran>, [online: 04.05.2020].

Connectivity function made that possible. Such a speed may be enough to allow operators to sell various industry-dedicated services with critical applications and of a latency-sensitive nature.²⁵ Currently, OpenRAN rollout is limited to country networks or some city and suburban ones; soon it will be helpful in setting up so-called private networks too, which are going to be installed in office spaces, shopping malls, stadiums, or sports arenas.²⁶ At the same time, O-RAN companies such as AltioStar, Mavenir, and Parallel Wireless – all US-based – have been small in relation to big RAN suppliers and the O-RAN market has been lacking support and financing. Now, in the 5G times, the market of BTS production is opening for smaller companies as well, and what counts here and now is increasingly the know-how on telecom protocols, and especially the software they help create.

American experts are aware that the domestic telecom service sector won't catch up with the 5G Big Four and the upper hand they enjoy in terms of fully integrated 5G network solutions, but they encourage US telecoms to more often try and use the best vendors to build networks in a more modular form. Through this, they are hoping to bring advantages in setting standards for new technology development and software design.

Vitaly, what is also needed is to look at the OpenRAN value chain and identify the elements that are key in terms of this market's sustainable growth, first and foremost silicon chips that are the heart of 5G, and to foster their rapid-fire development in the US. To that end, incentives, e.g. tax breaks, for such chip manufacturers as Intel, Qualcomm, NPX, Broadcom, and Nvidia will be necessary.²⁷

Industry-wide, initiatives that aim to help deploy these solutions on a large scale across not only the US but also like minded-countries come to the rescue. Many telecoms, apart from American ones, joined the ranks of at least three existing industry alliances, O-RAN²⁸ being the biggest. A few months ago, a large coalition named Open RAN Policy Coalition was formed, aiming to lobby for OpenRAN in the US government as a key element of 5G network and for expanding the supply chain regarding advanced wireless technologies. The association brings together the companies from all over the world, including telecom operators and technology suppliers,

among them Airspan, AltioStar, AT&T, AWS, Ciena, Cisco, Cohere Technologies, CommScope, Crown Castle, DeepSig, Dell Technologies, DISH Network, Facebook, Fujitsu, Google, Hewlett Packard Enterprise, IBM, Intel, JMA Wireless, Juniper Networks, Marvell Technology Group, Mavenir, Microsoft, NEC Corporation, NewEdge Signal Solutions, Nokia, NTT, Oracle, Parallel Wireless, Pivotal Commware, Qualcomm, Quanta Cloud Technology, Radisys, Rakuten, Reliance Jio, Robin.io, Samsung Electronics America, Telefónica, U.S. Cellular, US Ignite, Verizon, VMWare, Vodafone, World Wide Technology, and XCOM-Labs.²⁹ In the coalition and its recently appointed board, US enterprises predominate, with AT&T representative Chris Boyer as Chairman and Verizon (Nick Fetchko), Cisco (Eric Wenger), and Qualcomm (Becky Fraser) representatives in official positions. But a European entity also appears in the Coalition's twelve-person Board of Directors – Vodafone's Ed Howard became its member.³⁰

The model is gaining importance as the number of its implementations grows, including particularly the examples coming from the most advanced OpenRAN market, Japan, which was the first to be based on the open-interface model.³¹ The leader in Japanese solutions is the corporation Rakuten. Endorsement from a growing number of serious business players can also be seen, among them Vodafone that in November 2019, after a spate of OpenRAN trials in Turkey and South Africa, announced its intention to fast-track the technology and broaden vendor cooperation across the European ecosystem. OpenRAN alliance were also joined by such companies as Nokia and Ericsson and American heavyweights such as Cisco, Qualcomm and, most importantly, Microsoft. Experts view the commercial availability as still needing time, as the technology requires scalable, fast, and highly efficient vRAN architectures to grow first.³²

At the same time, points are raised about a series of actions that should be taken by US decision-makers in order to promote 5G growth as part of open architecture of RAN for 5G. They include making it a condition of telecom implementation subsidy to use American modular products and open interfaces. The need to point to these solutions as core ones within the updated national 5G strategy proclaimed by White House is an issue that has also been raised.

25 Janusz Chustecki, "Nokia – mamy najszybszą na świecie sieć 5G", Computerworld, <https://www.computerworld.pl/news/Nokia-mamy-najszybsza-na-swiecie-siec-5G,421136.html>, [online: 04.06.2020].

26 Cf. Andrzej Miłkowski, "Rynek producentów platform telekomunikacyjnych dla sieci komórkowych 5G to szansa rozwoju dla polskich firm programistycznych", <https://prostoibezposrednio.pl/blog/polscy-programisci-5g/>, [online: 24.05.2020].

27 John Hendel, "The hole in the Trump administration's emerging anti-Huawei strategy", Politico, <https://www.politico.com/news/2020/07/07/trump-administration-anti-huawei-strategy-348745>, [online: 20.08.2020].

28 <https://www.o-ran.org/membership>, [online: 19.08.2020].

29 <https://www.openranpolicy.org/faqs/>.

30 <https://www.openranpolicy.org/open-ran-policy-coalition-elects-board-of-directors-executive-committee/>, [online: 21.05.2020].

31 John Hendel, "The hole in the Trump administration's emerging anti-Huawei strategy", Politico, <https://www.politico.com/news/2020/07/07/trump-administration-anti-huawei-strategy-348745>, [online: 20.08.2020].

32 "VMware, Intel i Deutsche Telekom testują otwartą chmurową platformę vRAN", <http://www.virtual-it.pl/10129-vmware-intel-i-deutsche-telekom-testuja-otwarta-chmurowa-platforme-vran.html>, [online: 07.05.2020].

Tax rebates and other incentives to produce equipment and develop software in the US are listed among enticements to build OpenRAN model-conforming communication infrastructure. What has also been raised is the need to increase R&D incentives for the right technologies from USD 750 million in 10 years, put forward in the US telecommunications draft bill, up to at least USD 2 billion in the same time frame.

Among the chances for first significant deployments that would drive OpenRAN market forward, open modular system-based network development in rural areas is mentioned, which has the additional benefit of possibly solving the digital divide problem. Substantively, US government's purchasing power should also be used to stimulate the growth and deployment of OpenRAN architecture in the new-generation network building process. No doubt, these are valuable lessons for Europe as well.³³

OpenRAN in Europe

From the EU's perspective, not only taking action related to building a secure fifth-generation network but also increasing the presence of European companies in the process is of great importance.³⁴ Hence, in light of technological shifts taking place, other firms able to deliver OpenRAN-formula products should be taken into account besides, but also in cooperation with, well-entrenched telecom solution vendors such as Nokia and Ericsson. The process may go under way following a model of synergic collaboration among many interested parties, as evidenced by Ericsson and Nokia engagement in the O-RAN alliance and support from the latter for OpenRAN Policy Coalition.

Doubtless, both cooperation with the US and a high-level political debate is needed in this domain. The first chords can already be heard in Great Britain where on 24 April 2020 an inquiry (written, as befits the time of pandemic) on Security of 5G and Open Radio Access Networks was held. There, attention was drawn to the fact that paradigms that underpin the OpenRAN model can contribute to improving network security in Great Britain both in existing 3G, 4G or 5G networks and in upcoming generations of network technologies. The leading role of British companies in this technical innovation is also described as substantial, and not only due to Telecom Infra Project grouping British carriers Vodafone, BT, Telefónica (O2 UK) but also thanks to OpenRAN component vendors being in the Project's ranks.

OpenRAN philosophy open (again, pun intended) up the market for smaller companies which get the opportunity to specialise in certain components. Earlier, in closed architectures, barriers to entry were dauntingly high.

In England's Ipswich BT-sponsored TIP Community Labs is already running. This physical space allows member companies to cooperate for designing new solutions in the 5G area and beyond. Vodafone has started OpenRAN testing in Great Britain, Ireland, Mozambique, and the Democratic Republic of Congo. This year, Telefónica starts testing OpenRAN for 4G and 5G in Great Britain, Germany, Spain, and Brazil. Telefónica expects OpenRAN commercial deployment to speed up within the next 18–24 months.³⁵ All this shows that OpenRAN fits nicely into the plans of Her Majesty's government which aspires to have the country be a global 5G leader. In the inquiry already mentioned, recommendations discuss the possibilities for creating a conducive environment for Great Britain's OpenRAN market to flourish both in terms of increasing network security and market benefits (price-related among them). To this end, ensuring support, financial as well, for innovative British companies in radio access networks was pointed out as necessary. With regard to further R&D, establishing "British ARPA" is postulated, modelled on the American Advanced Research Projects Agency. Another regulation-related proposal posits lowering barriers for mobile network carriers in contracting services outside the pool of established vendors.³⁶

In January 2020 the UK's National Security Council first decided to exclude Huawei technology from the most sensitive parts of the British 5G network, even as the Council allowed it to be supplied as peripherals like phone masts and antennas, then in July decided to tighten the ban so that it applies throughout the country's 5G.

Oliver Dowden, Secretary of State responsible for digital matters, cited the opinion by National Cyber Security Centre as the reason, with negative effects of sanctions imposed by the US on Huawei in May 2020 set to impact the Chinese company's cybersecurity and supply chain stability, according to the British agency. The decision prepares the market for increased supplier diversification and stimulates both supply and demand, since it opens telecoms up to search for other, competitive market solutions. In keeping with the announcement, the UK's telecommunications law currently drafted is going to compel Huawei equipment elimination from 5G networks before 2027, but come 1 January 2021 telecoms operating in the British market will be barred from buying the Chinese firm's equipment for 5G rollout.

33 All OpenRAN-promoting actions listed on the basis of: Martijn Rasser, Ainikki Riikonen, *Open Future. The Way Forward on 5G*, 2020, p. 5.

34 Cf. Izabela Albrycht, Joanna Świątkowska, *Przyszłość 5G czyli Quo Vadis, Europo?*, <https://ik.org.pl/publikacje/przyszlosc-5g-czyli-quo-vadis-europo-2/>, [online: 4.05.2020].

35 Mark Jackson, "O2 UK Follows Vodafone into Testing an OpenRAN", ISPreview, <https://www.ispreview.co.uk/index.php/2020/01/o2-uk-follows-vodafone-into-testing-an-openran-network.html>, [online: 20.05.2020].

36 "SFG0027 - The Security of 5G", <https://committees.parliament.uk/work/134/the-security-of-5g/publications/>, [online: 08.05.2020].

Meanwhile in Germany OpenRAN is one piece of the puzzle in the wider debate on 5G network security and the related supply chain diversification. In early May 2020 Deutsche Telekom CEO Timotheus Höttges indicated that Berlin's decision on clarifying 5G construction security policy had been delayed due to the COVID-19 pandemic, but as regards the discussions now restarting, OpenRAN is "something which we are highly lobbying and which we are committing to".³⁷ In recent days, because of German regulators' decision not to exclude any 5G technology supplier, he called for anchoring in German legislation "the use of open, cloud-based technology for networks – known as OpenRAN ... as this would be important for Deutsche Telekom's future network development".³⁸

OpenRAN – a chance for Poland?

In Poland the subject of OpenRAN has been on the agenda of the Council for Digital Affairs and of meeting organised by the #CyberMadeInPoland initiative which gathers Polish companies that offer sundry solutions, 5G security among them.³⁹

Experts pointed that introducing a division between hardware and software sources constitutes an important factor in 5G component diversification and is also promising since it gives opportunity to Polish businesses and R&D entities especially in the software design and delivery segment. This is a "chance to develop innovative projects in Poland in cooperation with local governments, municipal companies, and firms that base their growth on using cutting-edge technology".⁴⁰ Thanks to new 5G standards and the shift in platform and service development philosophy, the market of telecom solution producers, which has been airtight to date, will open up so that Polish companies from the sector can get into it.⁴¹ Anticipating the events, we can assume this is the start of potential benefits for Polish companies and software developers who are world-calibre specialists, earning top spots in industry rankings. As OpenRAN solutions enter the global market, they see prospects opening up for them to share in the 5G app and service market and telecommunications products. This share will possibly be

shaping up on the basis of local resources, but it may also come to pass together with international companies, including telecom carriers operating in Poland, playing the role of sales channels or shareholders in joint investment ventures.⁴² Among them, although it is not the only scenario that will give it the proper foundation, the construction of Three Seas Digital Highway⁴³ can be envisaged.

The Council for Digital Affairs' experts pointed to three types of profits stemming from the OpenRAN model growth in Poland: strategic, technical, and entrepreneurial.

First and foremost, the open architecture model fits two important postulates by the European Commission that have to do with, on the one hand, a chance to achieve digital sovereignty in practice,⁴⁴ and on the other, a suggestion to diversify vendors that the document *Cybersecurity of 5G networks - EU Toolbox of risk mitigating measures* puts forward. Among its technical assets, the pundits mentioned notable decrease in network rollout time. In the proposed model it is no longer months but merely days. Last but not least, the roster of benefits comprises business advantages, among them IP production in Poland, which translates to the ability to licence IP to instead of *from* foreign parties. "A marked competitiveness increase within supply chains (i.e. in RAN or core networks), and thus lowered costs and improved quality" were also highlighted. OpenRAN also means "development and support for our export capabilities". That is why it is paramount to spark the discussion on this topic in Poland, as well as to encourage "active Polish entities in the global coalition". IS-Wireless, Ovoo, Comarch, T-Systems, and Atende are already being listed among the companies which can make their mark in the realm of 5G solutions. "The presence of these entities on a list which registers tests and pilot implementations could be a benefit, enabling them to find seeking partnership far easier. Poland must also, thanks to the backing from the Ministry of Foreign Affairs and the Ministry of Digital Affairs see to it that a portion of funds earmarked for international support and cooperation as part of upcoming legislation is available for Polish entities or that a joint fund is created. In addition, it seems that using other American funding for supporting similar projects, e.g. DARPA-related, is possible."

37 Neal Doran, "Vodafone takes seat on Open RAN policy board", <https://www.telcotitans.com/vodafonewatch/vodafone-takes-seat-on-open-ran-policy-board/1665.article>, [online: 21.05.2020].

38 "Deutsche Telekom diversifies suppliers 'regardless of politics'", <https://www.reuters.com/article/us-deutsche-telekom-results-huawei-tech/deutsche-telekom-reiterates-opposition-to-barring-huawei-from-germany-idUSKCN2591A9>, [online: 19.08.2020].

39 More at <https://cybermadeinpoland.pl>.

40 Council for Digital Affairs materials.

41 Andrzej Miłkowski, "Rynek producentów platform telekomunikacyjnych dla sieci komórkowych 5G to szansa rozwoju dla polskich firm programistycznych", <https://prostoibezposrednio.pl/blog/polscy-programisci-5g/>, [online: 24.05.2020].

42 Council for Digital Affairs materials.

43 More information and reports on Three Seas Digital Highway at <https://digital3seas.eu/>.

44 Cf. Izabela Albrycht, Michał Kanownik, Robert Siudak, 危机 [wēiji], https://ik.org.pl/wp-content/uploads/ik_brief_programowy_wzejii-1.pdf, s. 4 [online, 08.05.2020].

Conclusion

As 5G and subsequent network generations develop, they will be revolutionary in reinforcing the convergence of the real and the digital. This qualitative change will be followed by a far bigger quantitative need for telecommunication products and services. 5G deployment is thus also a revolution for the telecom market as we know it, with the catalogue of technology vendors joined by not only companies from the OpenRAN ecosystem but also visionaries, including satellite communication technology providers. Telecommunications market, much as the whole telecom industry, must prepare for this change and implement innovative strategies of sustainable growth that are going to allow the players to defend their market positions. OpenRAN is the answer to those challenges of growing economic and geopolitical importance of mobile networks that makes it possible to switch from a limited number of telecom technology suppliers' "proprietary 'end-to-end' solutions to an open market of "best-of-breed" system designs offered by numerous vendors".⁴⁵ As a result, the relatively closed off supply chain for mobile infrastructure has already been entered into by new vendors with companies such as Altiosstar, Mavenir, and Parallel Wireless. The companies which joined the alliances supporting OpenRAN commercialisation are of the opinion that this telecommunications network development model will make it easier to roll out 5G on a massive scale.⁴⁶ Particular governments as well as those responsible for economic support and recovery plans occasioned by COVID-19 consequences are going to be in charge of deciding whether and how to systemically support possible vectors of these changes. While the US has no domestic companies that deliver end-to-end telecommunications solutions, the European Union can and should to a large extent, in accordance with the idea of digital sovereignty and strategic autonomy, support domestic companies as of now in building 5G networks. Ericsson and Nokia are market leaders. The EU should also bolster their development and innovation in the global 6G race that is already starting. At the same time, Europe ought not to close off to open RAN architecture in network development, as in the longer term it may offer a chance for smaller European actors to join the 5G (and subsequent generations') supply chain and thus lead to increased diversity in vendor market, which agrees with the assumptions of 5G Toolbox. These two goals have to be reflected in both EU financial instruments in the next financial framework and R&D funds and in Member States' decisions as nowadays they are laying down the conditions for particular market players to get access to 5G building. For their part, telecom carriers should take both these perspectives into account as they make investment decisions on building new-generation networks.

⁴⁵ Dimitris Mavrikis, *Open RAN: Market Reality and Misconceptions*, p. 2.

⁴⁶ Ibidem.

Yet, we cannot forget that the new digital world underpinned by 5G will be exposed to dangers, including those generated by artificial intelligence or quantum computing, consequently ensuring cybersecurity and resilience of telecommunications networks must always be the priority.

OpenRAN component vendors and carriers need to address these threats using a risk-assessment model, security-by-design approach, and sectoral cooperation that are going to allow them to define best practices.⁴⁷ Geostrategically, working on cooperation structures with like-minded countries as regards key technologies is important; so it is in the case of OpenRAN and the current telecom sector revamp. Only such a model can contribute to making the motto "Together Against Adversarial Internet" come true: the words which are the lodestar for the sixth edition of European Cybersecurity Forum – CYBERSEC Global 2020.

⁴⁷ More: Jason S. Boswell, Scott Poretzky, "Security considerations of Open RAN, Ensuring network radio systems are open, interoperable, and secure by design", Ericsson, <https://www.ericsson.com/en/security/security-considerations-of-open-ran>, [online: 24.08.2020].



The Kosciuszko Institute is a non-profit, independent, non-governmental research and development institute (think tank), founded in 2000. The Kosciuszko Institute's aim is to influence the socio-economic development and the security of Poland as a dynamic member of the EU and a partner in the Euro-Atlantic alliance. The Kosciuszko Institute strives to spearhead positive changes, create and share the best solutions, also to the benefit of neighbouring countries which are building the rule of law, civil society, and free-market economy.

The Kosciuszko Institute organises the European Cybersecurity Forum – CYBERSEC and Polish Cybersecurity Forum – the first such conferences in Poland and two of just a few regular public policy conferences in Europe devoted to the strategic issues of cyberspace and cybersecurity. More: <http://cybersecforum.eu/>.

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