



# Open RAN Initiatives

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## Ready for Disruption: The Radio Access Network (RAN) and Global Telecom Equipment Industry

Twenty years ago, close to two dozen big companies, including American firms, supplied global telecommunications equipment. Today, five firms dominate this market: Huawei, Ericsson, Nokia, ZTE, and Samsung. These five sell proprietary, end-to-end equipment that includes a Radio Access Network (RAN) and what is often referred to as the packet “core”. The RAN comprises cell towers that broadcast and receive radio signals, while the core provides substantial communications services and functions as the gateway to the internet. U.S. firms, for a variety of reasons, chose not to produce end-to-end 5G RAN solutions for the global market.

“Opening” the RAN could disrupt the telecommunications equipment market and create new opportunities for the United States. The fundamental assumption behind the broad call for “openness” in telecom is that the proprietary and closed nature of today’s telecom equipment offerings reduces the number of options in the market. Advocates of openness argue that pulling apart and opening the hardware, software, and operating models that make up the RAN will create openings for innovation and competition outside of the five dominant companies.

The RAN is especially ripe for technological disruption because the dominant companies are repurposing quite a bit of 4G technology in their end-to-end 5G equipment.<sup>1</sup> Carriers may enjoy the simplicity of hiring a single provider to furnish their entire telecom network, but this also leaves them unable to take advantage of emerging RAN technology innovations (many pioneered by U.S. firms) that expand capabilities while reducing operating costs and power consumption.

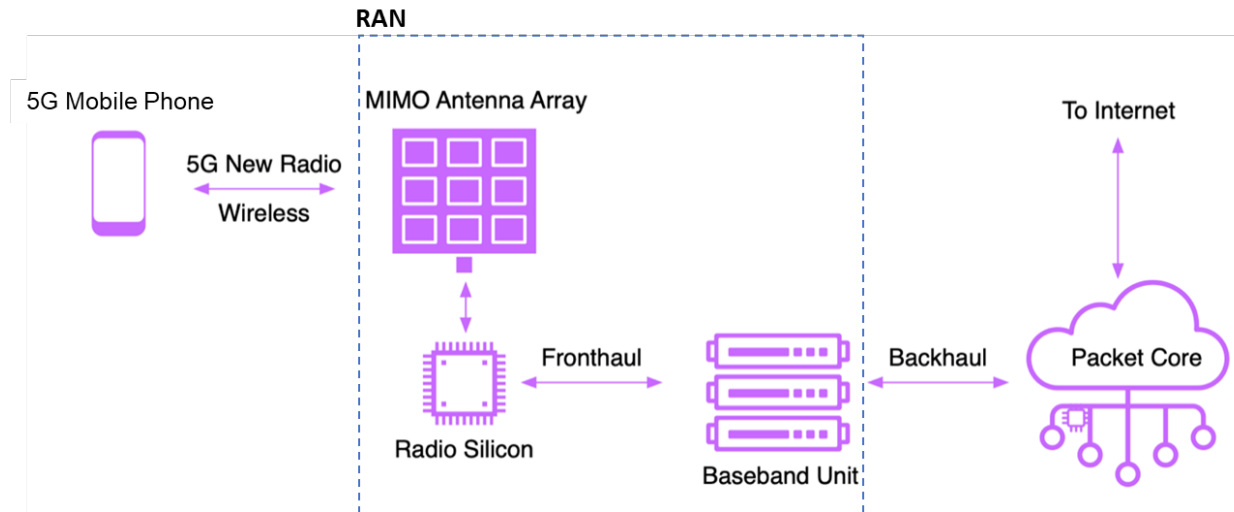
“The RAN is especially ripe for technological disruption because the dominant companies are repurposing quite a bit of 4G technology in their end-to-end 5G equipment.”

Openness also requires *open interfaces*, the technical specifications that allow components to operate with one another. Making these publicly available (versus proprietary to one company) facilitates the use of mix-and-match componentry from multiple vendors, which promotes greater choice, decreases costs, and enables network efficiency and flexibility. Ending reliance on proprietary hardware, openness frees companies to decouple software capabilities from the underlying hardware. This also creates opportunities for innovative service providers to come in with new, AI-based operating models that achieve higher performance, fewer outages, and ultimately larger profits. These changes could disrupt the current telecom equipment industry even if the incumbent providers choose to embrace these trends. The net result will produce more capable, customized, and affordable telecommunications.

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<sup>1</sup> Organizations supporting an open RAN include the O-RAN Alliance, Telecom Infra Project, 3GPP, O-RAN Software Community, and Open RAN Policy Coalition.





*An example of simplified topology of a 5G RAN that depicts the path a signal takes from a mobile phone to the internet.*

## In-Q-Tel portfolio companies are helping realize the vision of an Open RAN

In-Q-Tel invests in commercial technology startups and helps them deliver solutions to national security partners. In-Q-Tel also evaluates technologies and markets from a national security perspective. For many years, In-Q-Tel has supported technologies to improve performance, reduce power consumption, and increase the operating efficiency of components of an Open RAN. Several of the companies in which we invest offer products that can be used across the radio frequency spectrum, enabling them to better serve the global market.<sup>2</sup>

Moreover, In-Q-Tel sees potential synergies between opening the RAN and other areas of technology innovation. For example, the next generation of antennas (Massive MIMO Arrays) dramatically increases the number of antenna elements (from four, eight, or to up to 128). The control of these antennas can move to a single Application Specific Integrated Circuit (ASIC) – an application-specific semiconductor, or chip. As 5G capabilities mature, demand for specialized silicon to support predominant uses can grow. In this way, RAN innovation can spur further chip innovation, an area in which U.S. industry excels.

The U.S. government has expressed concerns about the security of 5G infrastructure provided by Chinese companies Huawei and ZTE.<sup>3</sup> These concerns pertain to the ability of the Chinese government to compel Huawei to provide access to information running on the equipment as well as leverage a state's dependence upon Chinese telecom infrastructure.

## Moving toward an Open RAN is essential for U.S. national security

Promoting a more open and competitive telecom paradigm would dilute the power of any single provider and help U.S. businesses compete to provide the world's 5G backbone. The development of transparent standards and open interfaces makes it easier to replace components and reduce

<sup>2</sup> Much of the global commercial 5G market uses mid and low band spectrum, while most U.S. companies use high-band frequencies (mmWave) that require a denser network of radio towers, creating additional costs and complexities. U.S. companies that can provide solutions across the radio frequency spectrum are better positioned for global competition.

<sup>3</sup> <https://www.nytimes.com/2020/06/30/technology/fcc-hua>.



supply chain dependencies. These also can enhance security by enabling more crowd-sourced and peer-reviewed software. Openness is not a security panacea, however. Competitors can sometimes gain advantages through early adoption of opensource technologies. More complex and decentralized networks also require more operational oversight. The U.S. and its partners must remain vigilant in testing the security of 5G components and systems.

Open RAN currently remains an ideal. Many companies have embraced the concept of openness, but product integration remains uneven. While Japan's new Rakuten Mobile is pioneering services that use Open RAN, and Nokia has vowed to pursue openness within its existing equipment systems, it remains unclear whether telecom operators are willing to embrace a more complex, multi-vendor approach to realize the advantages of an open, virtualized RAN.

These uncertainties around market size and commercial use impede investment in Open RAN-related products, and startup companies face difficulties accessing capital. U.S. competitiveness in the global 5G market is further complicated by the fact that many U.S. commercial entities have been allocated millimeter wave (high band) spectrum. Not only do most global commercial markets rely on mid-band spectrum, but millimeter wave spectrum deployment incurs higher costs which must then be borne by equipment suppliers and operators as well as end users.<sup>4</sup> That said, the Department of Defense began showing greater flexibility in spectrum allocation, as demonstrated by the recent release of some mid-band spectrum to the civilian sector.<sup>5</sup>

### The U.S. should develop a national policy and implementation plan to support openness in the 5G ecosystem

While the most recent U.S. National Strategy to Secure 5G<sup>6</sup> offers a solid point of departure, a more detailed, resourced national policy and associated implementation plan is needed to address national economic and security objectives. U.S. companies would benefit from more closely integrated research, development, and deployment effort; startups require improved access to capital and ultimately chip manufacturing facilities. A national policy could accelerate related issues regarding the development of standards, increasing access to and efficient use of spectrum, expanding software options or opensource components, piloting of use cases, and coordinating with allies and partners.

Openness should be an integral operational aspect of a national policy. Congress recently has crafted proposals to accelerate movement toward an Open RAN.<sup>7</sup> Promoting openness – including incentivizing U.S. innovation -- would benefit the United States and its international partners, as well as global consumers, by providing a more secure, efficient, and capable telecommunications infrastructure.

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<sup>4</sup> This is a largely function of the Department of Defense's historical use of mid and low-band spectrum. Potential solutions include sharing or ceding spectrum to commercial entities.

<sup>5</sup> <https://breakingdefense.com/2020/08/pentagon-gives-up-huge-slice-of-spectrum-for-5g/>

<sup>6</sup> National Strategy to Secure 5G, March 2020 <https://www.whitehouse.gov/wp-content/uploads/2020/03/National-Strategy-5G-Final.pdf>

<sup>7</sup> Drew FitzGerald, Senators urge \$1 Billion Plan to Loosen China's Grip on 5G, Jan 14, 2020, The Wall Street Journal. <https://www.wsj.com/articles/senators-propose-bill-to-subsidize-u-s-firms-5g-efforts-11579031806>; various members of congress have called for greater investment in Open RAN as part of an effort to expand broadband access in the United States. See <https://www.commerce.senate.gov/2020/6/wicker-walden-release-broadband-connectivity-and-digital-equity-framework> and <https://matsui.house.gov/news/documentsingle.aspx?DocumentID=1958>