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The U.S. Mobile Network Industrial Base

An Assessment and U.S. Government Action Plan

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Research Report

Radio access networks (RANs) are the wireless entry points into global telecommunications networks and the information ecosystem. RAN systems have evolved from simple towers with minimal digital electronics to sophisticated edge nodes with organic cloud and compute capabilities. RAN platforms and applications will become increasingly important as ever-smarter devices—along with robots, drones, and autonomous vehicles—abandon wired connections.

The leadership of the U.S. Department of War (DOW) has expressed concern that military information requirements are outpacing DOW mobile wireless capabilities.[1] Therefore, DOW has established the FutureG office under the Under Secretary of War for Research and Engineering to "adopt, adapt, and advance commercial technologies . . . and increase U.S. defense utility of commercial developments."[2] The FutureG office has articulated several goals for future mobile wireless networks in its Strategic Roadmap.[3] We used these goals as the desired "ends" of the FutureG strategy and organized them into two categories to assess courses of action (COAs) that the U.S. government could take to achieve these goals. The first category of goals focuses on the RAN systems themselves, including where they are produced, their security and level of openness, and the competitiveness of the U.S. industrial base in global markets:

- Reestablish U.S. mobile wireless equipment production that is competitive with the five Tier 1 incumbents: Huawei, Ericsson, Nokia, ZTE, and Samsung.
- Address security risks across cyber, operational, and supply chain actors and activities.
- Deliver resilient and open commercial RAN solutions to DOW, including virtualized hardware and open-source software.
- Provide dual-use innovations that promote the United States as a global RAN innovation leader.

The second category of goals is more expansive, describing the capabilities and beneficial effects that DOW hopes to achieve as advanced mobile networks are deployed. These goals will likely require support from cloud, artificial intelligence (AI), and other application providers across the information communications ecosystem in addition to RAN equipment providers. These broader goals include the following:

- integrated sensing and communications (ISAC) using commercial networks and technologies
- agile spectrum capabilities for efficient use and seamless sharing or coexistence
- ubiquitous, secure, and instant access to DOW, coalition, and commercial networks
- expeditionary and tactical use of commercial network technologies
- new workforce development models for national defense requirements and marketable skills.

China's government is also focusing its resources to advance its own information communications ecosystem. It has placed the 6th generation of telecommunications (6G) among its top priorities for $1.5 trillion in "guidance funds" to develop technologies, drive standards, and gain global market share. China plans to launch 6G pilots in 2026, followed by a full commercial launch in 2030. To support this plan, China has the world's leading RAN industrial base. Huawei has made a massive cumulative investment in research and development (R&D) and produces world-class RAN hardware and software.[4] Huawei and ZTE combined capture about 46 percent of the global RAN market and are likely to increase their share further.[5] They have built the world's largest 5th generation of telecommunications (5G) infrastructure within China, comprising 4.5 million 5G base stations. 5G services are expected to account for 75 percent of traffic by 2027.[6]

In comparison, the United States has 450,000 public cell sites, and 70 percent of them are 5G capable.[7] U.S. mobile network operators have incurred large debts to purchase the spectrum and equipment needed to provide these 5G services.[8] Despite these investments, network operator revenues have remained flat. This is expected to slow these operators' purchase of new equipment for 5G-Advanced services, thus limiting growth opportunities for RAN equipment providers.[9] More importantly, slowing equipment purchases could delay the deployment of advanced 6G capabilities (e.g., AI at the edge and ISAC) for the U.S. government and commercial users.

U.S.-based RAN equipment providers face even greater challenges. Full-stack U.S. RAN makers have a minuscule share of domestic and global markets and have become niche providers. This has caused U.S. network operators to rely on foreign suppliers, which has increased DOW concerns about potential cyber backdoors in imported hardware and software components.

On the positive side, the United States dominates other crucial segments of the broader information communications ecosystem, such as software, cloud compute, data centers, and the services that data centers provide.[10]

In this report, we describe the analysis that RAND conducted to help DOW achieve the goals that it has articulated for next-generation mobile wireless networks. (Because we were given a timeline of three to five years for this analysis, we set 6G as the next generation.) The report is organized into four sections. In the first section, we assess five alternative COAs for the U.S. government to achieve DOW's goals. In the second section, we further evaluate the COAs that we assessed as being most likely to achieve these goals. We then describe an action plan to implement these recommended COAs. In the fourth section, we summarize the conclusions drawn from the RAND analysis.

Key Findings

This assessment of the U.S. mobile network industrial base has identified a promising potential strategy for DOW: Leverage U.S. strengths by establishing a public-private partnership (PPP) between the U.S. government and leading tech companies (*Big Tech*), network carriers, and RAN component providers to build a 6G ecosystem that delivers advanced services to commercial and government customers.

In this partnership, commercial firms' role would be to

- design and operate 6G networks that provide advanced platforms and services for commercial and government users
- harness commercial innovations, investments, and private capital for scalable deployment
- collaborate with government agencies to ensure interoperability among providers and network security.

The U.S. government role in the PPP would be to

- provide spectrum, loans, R&D grants, and other incentives to commercial teams
- identify 6G R&D, software, and hardware production activities that might be vulnerable to espionage or exploitation and ensure that these activities are performed by trusted U.S. companies or onshore subsidiaries or affiliates of foreign companies
- launch a prototype pilot project to demonstrate key 6G-delivered capabilities by 2030.

To achieve an initial capability by 2030, the U.S. government should launch a prototype project to demonstrate the potential uses and profitability of 6G-delivered services. Commercial firms should be allowed to offer whichever services they believe would be most profitable. The U.S. government should focus its investment on the highest-priority service that it needs. Options for the U.S. government include supervised autonomy, ubiquitous AI agents at the edge, immersive extended reality, and integrated sensing and communications (ISAC).

We recommend that the U.S. government prioritize an ISAC capability to detect and track drones and other air vehicles because of the primacy of counter-drone and air and missile defense capabilities in the National Defense Strategy.[11] The technology industry should be encouraged to design 6G networks that meet firms' own commercial priorities while providing ISAC for the U.S. government.

Alternative Courses of Action for the U.S. Government

We developed and assessed five alternative COAs for the U.S. government to achieve FutureG's goals. (Although the goals motivating our analysis came from DOW, their benefits and the efforts required to achieve them involve departments and agencies across the entire U.S. government.) The first three COAs focus specifically on the RAN industrial base, while COAs 4 and 5 take a more strategic approach

by engaging the broader commercial information communications ecosystem:

- COA 1—Do nothing; let U.S. and global markets determine how RAN producers and capabilities evolve.
- COA 2—Directly subsidize a U.S.-based company to become the dominant U.S. RAN provider.
- COA 3—"Onshore" more of Ericsson, Samsung, and Nokia RAN production activities.[12]
- COA 4—Encourage Big Tech and its commercial partners to build an advanced ecosystem that is connected by 6G.
- COA 5—Establish a PPP between the U.S. government and Big Tech to build an advanced, dual-use 6G ecosystem for commercial and government users.

Course of Action Assessment

What follows is a short assessment of each COA in the context of DOW's goals.

Course of Action 1, Let Markets Determine Radio Access Network Providers, and Course of Action 2, Subsidize a U.S.-Based Company to Become Dominant U.S. Radio Access Network Provider

It is unlikely that a U.S.-based RAN provider will emerge with sufficient market share to displace any of the Tier 1 incumbents by 2030. As shown in Table 1, the Tier 1 RAN incumbents had a cumulative share of more than 93 percent of the global market in 2023. Of these, Ericsson is the largest provider in the United States, handling 60 percent of U.S. RAN traffic.

It is unlikely that a U.S.-based RAN provider will emerge with sufficient market share to displace any of the Tier 1 incumbents by 2030.

Combined sales of the five U.S. companies listed in Table 1 were about 2 percent of the 2023 global RAN market. These companies would need to grow their combined sales by almost 12 times to equal Ericsson's 2023 global RAN sales of $9.7 billion, and they are not on a growth path to displace any of the Tier 1 companies by 2030. Each of the U.S. companies has faced weak markets, and Mavenir has stopped making hardware. Weak markets have also hurt Ericsson and Nokia—the number 2 and number 3 incumbents by sales volume—because they have suffered large losses in several of the past ten years.[13]

Direct U.S. subsidies would be expensive and unlikely to produce another Ericsson-sized global competitor by 2030. We appraise that the cost of building a U.S. competitor to displace Ericsson would be greater than or equal to Ericsson's market value, which was $32 billion U.S. dollars as of December 31, 2025. (That value is calculated by multiplying the company's share price on that date by the number of shares outstanding, and it represents the price Ericsson would sell for on the open market.) On that same date, Ericsson had total assets of between $28.5 billion and $30.4 billion U.S. dollars, including cash and cash equivalents; inventory and accounts receivable; property, plant, and equipment; and intangible assets, such as patents and intellectual property. A new competitor would need several years to develop a similarly expert workforce, develop and produce quality products, establish contracts with suppliers, build relationships with customers, and win contracts. It would likely be far easier, quicker, and cheaper to simply buy Ericsson than to attempt to build a company to replace it. For these reasons, Ericsson's market value likely understates the cost of growing a competitor to displace it in the United States and global markets.[14]

TABLE 1

U.S. Providers Are Unlikely to Displace Tier 1 Radio Access Network Incumbents by 2030

Company	Global RAN Share (%)	Global RAN Sales ($)	Global R&D ($)	Global Market Cap ($)
Global Tier 1 Incumbents				
Huawei	33.3	12.5 billion	23.2 billion	Privately held
Ericsson	26.0	9.7 billion	4.9 billion	32 billion
Nokia	18.6	6.97 billion	4.7 billion	36 billion
ZTE	12.4	4.6 billion	3.1 billion	26 billion
Samsung	5.9	2.2 billion	Not available	613 billion
U.S. providers				
Amphenol	~1.2	466 million	Not available	165 billion
Mavenir	<1	56 million	Not available	300 million–400 million
Cambium	<<1	176 million	50 million	74 million
Airspan	<<1	68 million	Not available	6 million–300 million
Airgain	<<1	60 million	12 million	250 million–750 million

SOURCES: Dell'Oro Group, "RAN Equipment Market to Remain Uninspiring, According to Dell'Oro Group"; FactSet, homepage.
NOTE: < = less than 1 percent; << = much less than 1 percent.

Course of Action 3, Onshore More of Ericsson, Samsung, and Nokia Radio Access Network Production

It might be feasible for the United States to onshore more of the RAN production activities conducted by Ericsson, Nokia, and Samsung, shown in Table 2. As of this writing in early 2026, the United States accounts for about 40 percent of Ericsson's RAN sales. Ericsson conducts system architecture and R&D activities in various European countries, the United States, Canada, and China. It produces key software in these same countries and India, including systems management and orchestration (SMO), RAN Intelligent Controller (RIC), real-time applications (rApps), and application program interface (API) software. Ericsson performs final assembly of the radio units, distributed baseband units (DUs), and centralized baseband units (CUs) used in U.S. networks at its Texas manufacturing facility. Components and subassemblies for these hardware units are sourced globally, including from vendors in Europe, China, Brazil, and India. Final testing and integration are conducted by Ericsson on-site for U.S. networks.

North America accounts for an estimated 25 percent of Nokia's RAN sales—although it has lost Verizon and AT&T as customers for its public RAN networks. (Verizon and AT&T contract with Nokia for their private network sales.) Nokia conducts its key R&D and software production activities in the United States, Europe, India, and China. It manufactures radio unit, DU, and CU hardware and subassemblies in Europe, the United States, Asia, and Mexico rather than in a dedicated U.S. facility. Testing and integration are conducted on-site for U.S. networks.

Samsung reports conducting R&D in South Korea, China, and the United States, and it produces major software and hardware components in South Korea. It sources subassemblies in South Korea and other Asian countries. Testing and integration are conducted on-site for U.S. networks. Samsung is the smallest of the top five global RAN providers and has a growing presence in the United States because of its 2020 contract to help build Verizon's 5G network. (Samsung does not break out its U.S. RAN sales, and they are a small share of Samsung's overall global sales revenue.)

The Cybersecurity and Infrastructure Security Agency, the Defense Counterintelligence and Secu-

TABLE 2

Location of Production Activities for Major Radio Access Network Providers to U.S. Networks

Component	Ericsson	Nokia	Samsung
RAN architecture and R&D	Europe, United States, Canada, China	United States, Europe, India China	South Korea, China, United States
SMO/RIC, other RAN software, rApp/API	Europe, United States, Canada, China, India	Europe, United States, India, China	South Korea
Radio unit, DU, CU hardware	United States (final assembly and 55 percent of content)	Europe, United States, Asia, Mexico	South Korea
Subassemblies	Europe, China, Brazil, India	Europe, Asia, United States, Mexico	South Korea, other Asian countries
Testing and integration	United States	United States	United States
Estimated U.S. share of total RAN sales	40 percent	25 percent	N/A

SOURCES: We based this assessment on the following publicly available statements and data from AT&T, Ericsson, Nokia, and Samsung: AT&T, "AT&T to Accelerate Open and Interoperable Radio Access Networks (RAN) in the United States Through New Collaboration with Ericsson"; "Ericsson Sets Up RAN Software R&D Unit in Bengaluru for Innovations in 5G, 5G Advanced"; Murphy, "Ericsson Accelerates Open RAN Through NTIA Funded Open RAN R&D Center"; Ericsson, "Austin R&D Center"; Wooden, "Ericsson Opens New R&D Units in India and Hungary"; Ericsson, "Our U.S. Research and Development Portfolio"; Ericsson, "Ericsson in Sweden"; Ericsson, "Innovation with Future Technologies"; Tomás, "Ericsson to Establish 5G R&D Facility in France in Early 2020"; Ericsson, "North East Asia"; Ericsson, "Ericsson D-15 Labs"; Ericsson, "Ericsson Next Generation Supply Chain"; Nokia, "Worldwide Offices"; Nokia, "Decades of Delivering and Commitment to the U.S."; Nokia, "Nokia Starts Production of Next Generation 5G Equipment in India"; Nokia, "Nokia Opens New State-of-the-Art R&D and Manufacturing Campus to Deliver Next-Generation Networks Built for AI"; Nokia, "Nokia Supplier List"; Pretz, "Nokia Bell Labs Breaks Ground for Its New N.J. Headquarters"; Nokia, "Nokia Opens 6G Lab in India"; Nokia, "Nokia Opens New O-RAN Collaboration and Testing Center in the U.S."; Nokia, "Nokia Plans to Expand U.S. Investment by $4 Billion in R&D and Manufacturing for AI-Ready Network Connectivity"; Nokia, "Our Global Research Locations"; Samsung Research, homepage; Samsung, "Samsung Research America"; Samsung Newsroom India, "Samsung R&D Institute India"; Samsung, "R&D Center."
NOTE: N/A = not applicable.

rity Agency, and other U.S. government agencies assess offshore sources of telecommunications R&D, hardware, and software for potential national security risks. If these agencies determine that foreign sources make RAN networks vulnerable to theft, espionage, or cyber exploitation, then Congress or the administration might determine that more of this production must take place on U.S. soil. As a recent example, the Federal Communications Commission (FCC) has banned the sale of foreign-made Wi-Fi routers in the United States, citing national security concerns.[15]

It is beyond the scope of this analysis to evaluate the vulnerability of the offshore R&D and foreign-produced software and hardware used by Ericsson, Nokia, and Samsung.[16] For the purposes of this analysis, we assessed three alternative levels of onshoring against applicable laws, regulations, and executive orders.

Incentivize more onshore hardware production: A minimal change would be to incentivize Samsung and Nokia to meet Ericsson's existing level of U.S. production. Ericsson is certified under the Build America, Buy America (BABA) Act to sell wireless equipment to networks receiving federal funding under the Broadband Equity, Access, and Deployment (BEAD) Program.[17] Certification requires that the final assembly of RAN hardware and 55 percent of its content value—including software and hardware components—be produced in the United States. Nokia produces some fiber-optic equipment in the United States under the BEAD Program, but it does not yet produce RAN components onshore. The United States could extend the BEAD Program to fund additional wireless equipment purchases from Nokia and Samsung in return for them meeting the BABA onshore production requirements. However, this would still leave R&D, software, and some hardware production offshore.[18]

Contract for onshore software production: A larger change would be to require RAN makers receiving U.S. government appropriations (e.g., through the CHIPS and Science Act,[19] Title III of the Defense Production Act,[20] or other appropriations)

to produce their software through U.S. subsidiaries. The Federal Acquisition Regulation, Buy American Act, and Modular Open Systems Approach could be used to mandate onshoring for software paid in part with U.S. government funds. This could include software for the SMO, RIC, and rApps, as well as APIs. Conversely, the SECURE Technology Act establishes a Federal Acquisition Security Council that can mandate the removal of software that poses a supply chain risk.[21]

Mandate onshore R&D, software, and hardware production: A more maximalist approach could require Ericsson, Nokia, and Samsung to conduct R&D and produce software and hardware for systems that the government will use exclusively through onshore U.S. subsidiaries or affiliates. These onshore entities would be incorporated in the United States and controlled by boards composed of U.S. citizens with the authority to operate autonomously from their parent corporations. The requirement for U.S. onshore entities could proceed from an expansive use of the following existing laws and regulations:

- Title II of the Defense Production Act could be used to declare that the domestic industrial base is insufficient and mandate a domestic facility to fulfill government orders for RAN.[22]
- The National Industrial Security Program allows foreign companies to work in the United States under special security agreements (SSAs) or proxy agreements. These require the company to establish a U.S. subsidiary controlled by an independent U.S. board. BAE Systems, Airbus, Thales, and other Europe-based companies supply sensitive equipment to DOW under such arrangements.
- Section 806 of the 2011 National Defense Authorization Act (NDAA) gives DOW authority to exclude a vendor if there is a supply chain risk, which could be interpreted to include lack of domestic corporate oversight of software and hardware production security.[23]
- Section 889 of the 2019 NDAA and Section 5949 the 2023 NDAA could be used to ensure that no foreign adversary–sourced software is being used at companies that are conducting R&D or producing 6G components for the U.S. government. Applying these laws might require the covered entities lists to be expanded to all firms owned by adversarial states, such as China or Russia.[24]
- The 2026 NDAA emphasizes secure supply chains focusing on the origin and development of software, AI (Sections 1512, 1513, and 1532), and hardware (Sections 842 and 850).[25]
- Executive Order 13873 blocks information and communications technology designed or developed by persons "owned by, controlled by, or subject to the jurisdiction or direction of a foreign adversary." This order could be reframed to empower the Secretary of Commerce to mandate that any critical infrastructure vendor must have a domestic source to mitigate the risk of global supply chain disruptions.[26]
- Executive Order 14017 allows the U.S. government to onshore "defense-critical capabilities."[27]

As an example, BAE Systems Inc.—a U.S. subsidiary of the United Kingdom (UK)–based BAE Systems—builds sensitive systems for DOW, including the electronic warfare suite for the F-35.[28] BAE Systems, Inc. operates under an SSA with DOW, and

A larger change would be to require RAN makers receiving U.S. government appropriations to produce their software through U.S. subsidiaries.

sensitive components are designed and manufactured in its U.S.-based facilities. Key safeguards include a board of directors independent from the UK parent company board, a Government Security Committee comprising outside directors responsible for overseeing compliance with U.S. security and export regulations, and firewalls restricting technical data and program information from the UK parent company.

Ericsson and Nokia are establishing entities that might enable them to operate in a similar fashion. Ericsson Federal Technologies Group is a new subsidiary that has applied for Foreign Ownership Control or Influence mitigation and a facility security clearance. Nokia Federal Solutions appears to be an affiliate also intended to conduct sensitive work for the U.S. government.

Each of the onshoring approaches discussed could be applied when the U.S. government is funding the development or purchase of RAN systems. This suggests that the U.S. government should provide funds to build the 6G ecosystem if it wants existing RAN vendors to move their R&D and production onto U.S. soil. (We will discuss U.S. government participation in 6G RAN development in COA 5.)

Alternatively, the U.S. government could impose a sweeping new law or regulation forbidding the import of foreign-produced RAN equipment. In theory, such a prohibition could be similar to the ban imposed on Wi-Fi routers that are produced offshore.[29] In practice, it would be difficult to ban foreign RAN equipment, because no full-stack U.S. RAN providers exist to serve as alternatives. (And, as discussed in COA 2, it would likely take several years to grow a U.S.-based alternative.) Therefore, the aim of new regulations would more likely be to move R&D and production of Ericsson, Nokia, and Samsung to their U.S. subsidiaries or affiliates.

The cost of COA 3 to the U.S. government could be zero if RAN providers voluntarily move R&D and production onshore. The cost to the U.S. government or its commercial partners could be higher if they took an equity stake as part of a deal to onshore RAN providers' production. Investment costs could reach as high as $17 billion to take a 50-percent equity stake in the U.S. affiliates of Ericsson and Nokia.[30]

Tech giants are already investing in 6G wireless infrastructure to expand their markets. However, they may not deploy an advanced ecosystem by 2030 on their own.

Course of Action 4, Help the U.S. Technology Industry Deploy an Advanced 6G Ecosystem

An alternative approach would be for the U.S. government to focus on helping the technology industry build an advanced ecosystem that would provide dual-use services for commercial and government users. The idea is that Big Tech wants to sell new services, such as AI agents, to edge and mobile users, and delivering those services at scale will require an advanced 6G network. Therefore, leading technology companies have an incentive to build 6G infrastructure to grow new markets. This approach plays to U.S. commercial strengths in software, cloud-based platforms and services, and integration.

Tech giants are already investing in 6G wireless infrastructure to expand their markets. However, they may not deploy an advanced ecosystem by 2030 on their own. As a leading example, Nvidia has partnered with Nokia, T-Mobile, Cisco, ODC, Mitre, and Booz Allen to "revolutionize communications" with AI.[31] The team is developing an AI-native 6G wireless stack intended to provide ISAC, dynamic spectrum sharing, and other advanced capabilities. However, carriers have expressed some concerns about the capital and operating costs of the Nvidia-led stack and might be slow to deploy it at scale in their networks.[32]

Meta had announced its intention to build 1,200 edge cloud nodes, each equipped with two to four H100 chips, to provide low-latency networks in target

regions. Use cases for these codes include real-time AI agents, immersive augmented reality (AR), and fast local chatbots. But Meta has recently scaled back this project to focus its resources on building AI models.[33]

Amazon Web Services, Microsoft, and Alphabet provide 5G core software on their cloud platforms that supports virtualized 5G RAN DU and CU and core network functions. They had initially marketed this software directly to private network operators, but they have stepped back because of slow sales, competition from market incumbents, and integration challenges. They now generally offer 5G core software through mobile network operators or RAN providers.[34]

Starlink is developing nonterrestrial networks and direct-to-cell RAN functions, and Amazon is exploring similar capabilities with its Amazon low earth orbit (LEO) satellite network. However, in the near term, data rates will be constrained by the size and power output of these constellations.[35]

The U.S. government could create a package of loans, R&D grants, regulatory relief, and other incentives to help the technology industry push ahead with its 6G ecosystem projects. However, the tech giants appear to be refocusing their investments on producing leading-edge AI models. This makes it unlikely that the tech sector on its own will deliver ISAC or other 6G services with the performance that the U.S. government wants by 2030.

Course of Action 5, Establish a Public-Private Partnership to Build an Advanced Dual-Use 6G Ecosystem

The U.S. government could directly contract for ISAC services, but it would be costly for the government to build all the 6G infrastructure needed, and it is unlikely that the government would use more than a fraction of its capabilities. Perhaps worse, a government-contracted 6G system might not promote the features that are most useful to commercial customers. To obtain ISAC and promote profitable commercial 6G services, the U.S. government could form a partnership with the technology industry. A PPP could produce dual-use infrastructure to provide advanced commercial services while meeting U.S. government needs.

The United States used a PPP to help SpaceX develop the Falcon 9 launch vehicle. In retrospect, the approximately $369 million that the National Aeronautics and Space Administration (NASA) spent on the PPP seems to be an extraordinary bargain—especially compared with the $20 billion that NASA has spent to date on the Space Launch System. A major factor in this cost difference was that SpaceX was free to design the Falcon 9 in the way it believed was most marketable for commercial services instead of having the U.S. government impose design features on the rocket. The result is that SpaceX now dominates the commercial launch market, a striking change from Arianespace and Russia's dominance in the first decade of the 21st century.[36]

More recently, the European Union, Japan, and China have each established PPPs to launch commercial 6G networks by 2030. The European Union has budgeted approximately $1 billion for the Smart Networks and Services Joint Understanding, and commercial firms have agreed to match with their own $1 billion investment. Japan has provided more than $2 billion to the NTT 6G R&D Center and allocated an additional $450 million for R&D grants as part of its Beyond 5G Promotion Consortium

SpaceX was free to design the Falcon 9 in the way it believed was most marketable for commercial services instead of having the U.S. government impose design features on the rocket.

(B5GPC). China has established the IMT-2030 6G Promotion Group to drive 6G strategy among its telecommunications operators, technology companies, and universities. Presumably, China will tap into the approximately $1.5 trillion in guidance funds that are allocated for 6G and its other highest-priority technical investments.[37]

Courses of Action Most Likely to Achieve Department of War Goals

We concluded that a combination of COAs 3 and 5 were most likely to meet the DOW goals. COA 3 could be used to ensure that the needed types and level of onshore production are achieved to meet system security requirements. This includes mitigating the threat of hostile foreign intelligence agencies inserting cyber backdoors or otherwise compromising RAN software and hardware. COA 3 could also strengthen the U.S. 6G supply chain and its ability to offer a full-stack 6G system to U.S. and global markets.

Foreign networks are most likely to be accessible by U.S. military forces if the networks use the same equipment and operating software. Other countries might be most willing to make their networks accessible if they are invited into a partnership.

COA 5 could be used to partner with leading tech firms to build an advanced 6G ecosystem. To be economically viable, this ecosystem must provide services that will generate high profits in commercial markets. AI-related platforms and agents, supervised autonomy for vehicles and robots, and AR/extended reality services are salient examples. The U.S. government could invest in those additional features that it would need to enable national security–related services, such as ISAC.

This is an appropriate place in the analysis to highlight a tension between the strategy of onshoring the development and production of RAN systems and the goal of making foreign networks accessible for U.S. military operations. Foreign networks are most likely to be accessible by U.S. military forces if they use the same equipment and operating software. Other countries might be more willing to make their networks accessible if they are invited into the partnership that was proposed in COA 5.

Successful PPPs try to include all potential users. Foreign partners are most likely to value the U.S. systems, including ISAC, if they are involved early in the development of these systems. To ensure their commitment to common networks and services for economic and security purposes, such partners should be involved from the very beginning in all the steps associated with these systems' development.[38]

Onshoring subsidiaries or affiliates of Ericsson, Nokia, and Samsung could offer an opening to establish stronger ties and sharing arrangements with their parent companies and countries. As the U.S.-based partners in COA 5 develop prototype systems and services, they could collaborate on the designs with their parent companies and train key personnel from allied countries. Similar arrangements could be made with other companies, such as between T-Mobile and its Deutch Telekom parent or a U.S. Fujitsu or Rakuten affiliate and their Japanese parent companies. As part of this collaboration, the parent companies could import key technologies produced by this partnership for use in their own national systems.[39]

Opportunities to engage allies will be included in the action plan that we describe in the following section.

Action Plan: A Public-Private Partnership to Develop a Dual-Use 6G Ecosystem

A U.S. government action plan to establish a 6G PPP should include five key elements, as depicted in Figure 1:

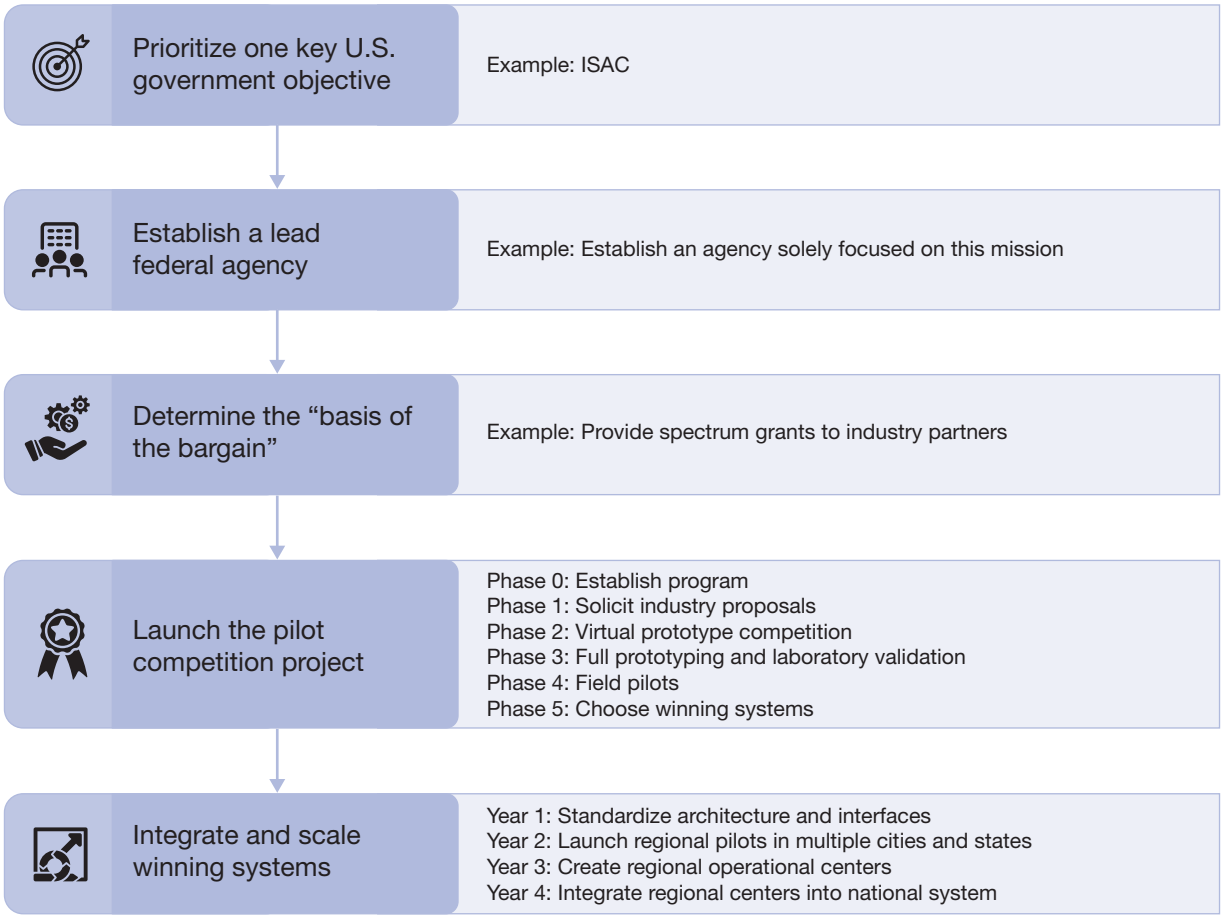
1. Prioritize one key U.S. government objective; for example, establishing an ISAC pilot project covering a major metropolitan area.
2. Establish a lead federal agency (LFA).
3. Determine the "basis of the bargain"—that is, what the U.S. government will contribute to the PPP to achieve the government's objective.
4. Launch a pilot competition among approved commercial teams to prototype the system.
5. Integrate and scale winning systems to expand coverage.

Prioritize One Key U.S. Government Objective

There are several 6G services that the U.S. government might want for military operations. These include AI at the edge for experimentation, agent development and training on a massive scale, supervised autonomy for robotic warehousing and delivery, AR/extended reality for training and operations, and ISAC to detect and track drones and other suspicious air vehicles. Although these and many other dual-use 6G services could be very useful, we use ISAC as our exemplar service because it was specifically mentioned in the FutureG road map, and it could address high-priority national defense objectives by helping counter drone incursions or attacks.[40]

Over the longer term, speeding the deployment of AI tools for training, experimentation, and building agents might be even more important for

FIGURE 1
Developing a Dual-Use 6G Ecosystem



U.S. security and economic competitiveness. With a population of 350 million, the United States will be at a severe disadvantage relative to China (with 1.4 billion people) in the number of people, including adepts, experts, and geniuses, who can be trained and organized to build new AI capabilities. The United States will need to employ AI much more efficiently and effectively to remain competitive. Therefore, the U.S. government should ensure that its 6G networks promote the dissemination of responsible AI training and tool-building capabilities through whichever services it supports.

We include a brief description of one ISAC application in the section that follows. As shown in Figure 2, it would take dozens of airborne radars and thousands of ground-based radars to detect and track drones flying over the contiguous United States at low altitude.

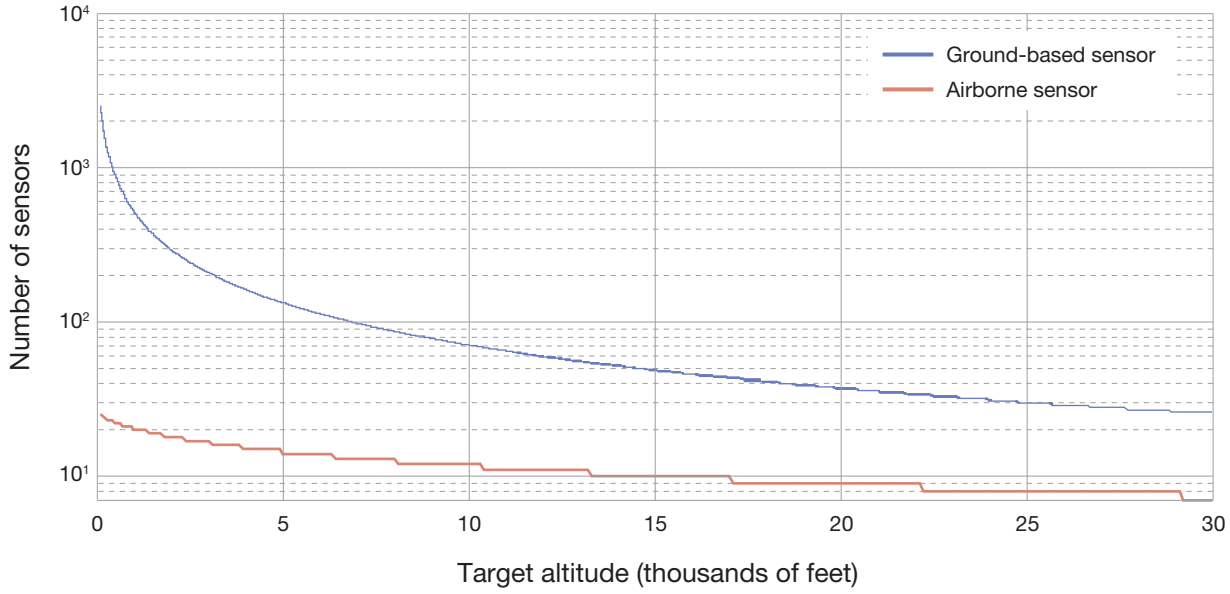
As a historical case, each airborne sensor orbit required four aircraft and seven aircrews to maintain continuous coverage over desert terrain over Iraq during Operations Northern and Southern Watch. Presumably, many more airborne or ground-based radars would be required to detect suspicious aircraft operating in heavy air traffic among buildings, mountains, trees, and other ground clutter. The scale of this challenge might greatly increase the cost of such systems as the Golden Dome for America.

Commercial 6G cellular networks could help reduce the military systems needed if such networks were equipped to perform passive coherent location, as described in Figure 3. The concept is that transmissions from digital television (using very high frequency [VHF] from 54 to 216 megahertz [MHz] and ultra high frequency [UHF] from 470 to 608 MHz) and frequency modulation (FM) radio stations (from 87.5 to 108 MHz) are reflected by moving air vehicles.[41] 6G networks could receive these reflections to detect and track drones and other air vehicles. (A more-complete description of passive coherent location techniques employing cellular telephone networks as a bistatic radar is provided in the notes.[42])

To perform the ISAC functions, 6G towers would need radios able to receive these digital television and FM radio signals. If greater precision is required, a fraction of the 6G towers could also be equipped to transmit a higher-frequency signal (as in the C-band now available to companies) to generate targeting-quality tracks and to discriminate among legitimate and suspicious traffic.[43] ISAC towers would need

FIGURE 2

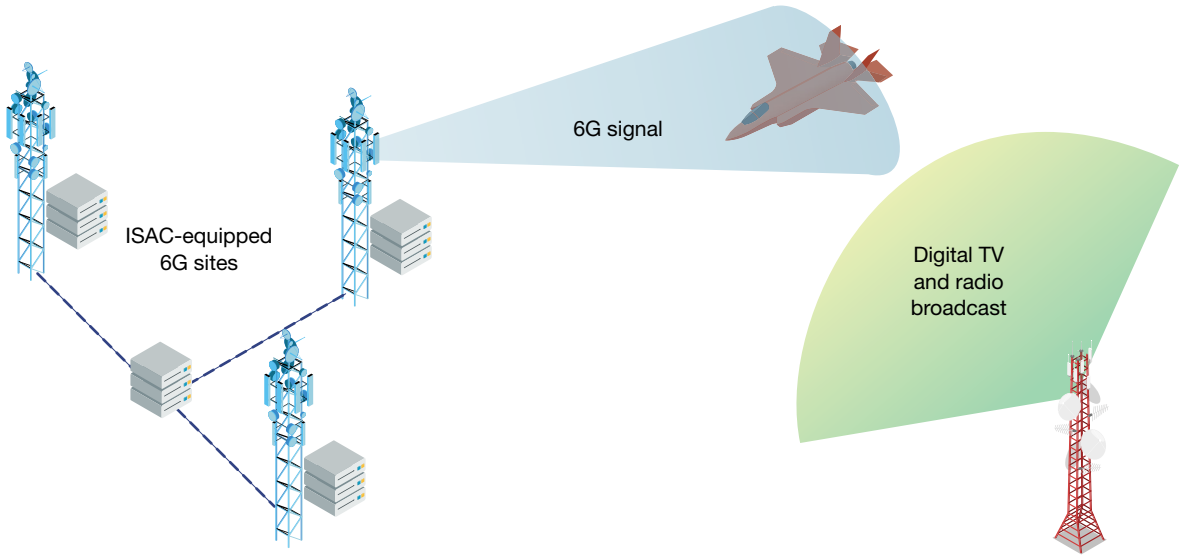
Ground-Based or Airborne Sensors Needed for National Air Traffic Coverage



NOTE: This figure assumes 60-percent efficiency in arranging sensors to cover the desired airspace. It does not consider sensor maximum range, only the radar horizon. It also assumes ground-based sensors at 20 m height, airborne sensors at 40,000 ft, and no terrain blockage.

FIGURE 3

Use of 6G Cellular Networks to Detect and Track Air Vehicles



enough compute capability organic to them or in edge clouds to generate detections and tracks and sort them out from a massive number of other reflections and signals. All such tracks would then be handed over to air defense authorities to monitor or intercept.

Importantly, though, not all of the 6G cell sites would need to be equipped for ISAC to function. Although the precise numbers required depend on signal geometry, the amount of air traffic, and the presence of ground clutter, a fraction of existing towers would likely be sufficient.[44]

Establish a Lead Federal Agency

The U.S. government would need to establish an LFA to ensure that the government receives the capabilities it needs and effectively advances dual-use 6G services. The U.S. government already has several efforts underway to improve airspace domain awareness and better regulate and control drone operations. To coordinate and advance these efforts while developing a prototype system, the LFA must have the following:[45]

- legal authority for civil procurement and spectrum coordination
- technical depth in sensing, radio frequency systems, and systems integration
- relationships with the technology industry, carriers, state and local governments, and civil agencies
- experience running open, multivendor commercial competitions
- authority and capability to award and scale civil pilots
- experience running secure programs and supporting classified tests.

The Missile Defense Agency, the Defense Innovation Unit, the Defense Advanced Research Projects Agency, and other government agencies have strengths in several of these areas and could have their authorities and staff expanded to cover the others. However, leading a 6G PPP with commercial firms would be a second duty for most of these agencies and could be a distraction from their existing missions. The Defense Innovation Unit might be better suited for partnering with Big Tech and other nontraditional suppliers, but it would need to greatly expand to manage a PPP of this size. Therefore, it might be better to establish a new agency solely focused on this important mission and carefully coordinated with these other federal agencies.

Determine the Basis of the Bargain

The FCC estimates that it would cost from $250,000 to $500,000 to equip and integrate a cell site with 5G hardware and software and edge compute, as shown in Table 3. We use this as a proxy for the minimum requirements to modernize an existing tower with the equipment and software needed to enable the ISAC capabilities described previously.

The Wireless Infrastructure Association counted 455,000 cell sites—including macrocells and outdoor small cells mounted on towers, buildings, and other structures—in the United States at the end of 2024, including 15,000 added that year. If 15,000 new sites were added each succeeding year, there would be 520,000 by 2030. The total cost of equipping this infrastructure would range from $33 billion to $260 billion, depending on the cost per tower and the percentage of towers equipped to support ISAC capabilities. (Please note that some towers might already be equipped with some portion of the hardware and software needed to support ISAC and so might reduce the number needing modernization.[46])

To attract commercial partners to invest in the needed 6G infrastructure, the LFA should prepare a package of financial and nonfinancial incentives. The most valuable incentive would be spectrum grants—especially large, contiguous blocks of spectrum available for licensed use with minimum caveats.

Spectrum might be sufficiently valuable to pay for much of the cost of deploying dual-use infrastructure. We estimated the potential value of a nationwide spectrum license, covering all 348 million Americans, as ranging from $7.7 billion to $327 billion, depending on how much spectrum is offered and its auction price, as shown in the lower portion of Table 3. Spectrum is valued in dollars divided by MHz of bandwidth multiplied by the size of the population covered. This value decreases if licenses are constrained with requirements to share with other users. As examples, Table 3 includes the value ascribed to spectrum in three recent auctions. The CBRS spectrum (Auction 105) yielded $0.22/MHz-population because of requirements for sharing with other users. Auctions 110 and 107 yielded $0.72 and $0.94/MHz-population, respectively, because of larger contiguous blocks of spectrum offered with fewer sharing requirements.[47]

Historically, the FCC has auctioned licenses to use this spectrum. These auctions can raise a large

TABLE 3

Estimated Costs of ISAC-Equipped 6G Networks Compared with Spectrum Value

Cost Per Cell Per Site	Low	Average	High
5G fully integrated, EMP-hardened cell site with mobile edge compute and embedded 5G core; 600 MHz; 6 GHz with fiber media gateway	$250,000	$375,000	$500,000
Notional Project Cost for 520,000 Sites	**25 Percent of Sites**	**50 Percent of Sites**	**100 Percent of Sites**
$250,000 per site	$33 billion	$65 billion	$130 billion
$375,000 per site	$49 billion	$ 98 billion	$195 billion
$500,000 per site	$ 65 billion	$130 billion	$260 billion
Estimated Spectrum Value for Population of 348 Million	**0.22 $/MHz-Population (e.g., CBRS Auction 105)**	**0.72 $/MHz-population (e.g., Auction 110)**	**0.94 $/MHz-population (e.g., C-Band Auction 107)**
100 MHz of spectrum	$7.7 billion	$25 billion	$32.7 billion
500 MHz of spectrum	$38 billion	$125 billion	$164 billion
1,000 MHz of spectrum	$77 billion	$251 billion	$327 billion

SOURCES: Features data from FCC, Secure and Trusted Communications Networks Reimbursement Program, *Final Catalog of Eligible Expenses and Estimated Costs;* CTIA, *2025 Annual Survey Highlights*; and Ford, "Wireless Infrastructure by the Numbers."
NOTE: CBRS = Citizens Broadband Radio Service; EMP = electromagnetic pulse. $/MHz-Population is the cost in dollars divided by the product of bandwidth in megahertz multiplied by the size of the population covered.

amount of money; for example, FCC Auction 107 brought in $81 billion.[48] However, the winners of spectrum auctions have sometimes been slow to build the infrastructure needed to use this spectrum. The FCC's recourse is to threaten to revoke these licenses, a process that can take years to resolve.[49]

This raises two approaches to funding the development of ISAC for the U.S. government. The first would be to auction spectrum as usual and have the proceeds flow to the U.S. Treasury. Separately, DOW could sign contracts with commercial firms to provide an ISAC pilot project funded with the usual appropriations. An alternative approach would be to grant spectrum licenses to commercial teams in exchange for providing ISAC and other services to the U.S. government. The grants would be for a renewable term—ten years, for example—and could be revoked if the licensee failed to meet its promised performance. The U.S. government could keep both options available to maximize its bargaining position with commercial firms.

In addition to spectrum allocations, the U.S. government could offer R&D funding, loans, challenge prizes, tax incentives, and contracts for services that have not been already traded for grants. Nonmonetary incentives could include access to U.S. government intellectual property, facilities, networks, land, and electrical power. Other potential incentives could include the relaxation of import tariffs, export sanctions, and antitrust regulations.

Launch Integrated Sensing and Communications Pilot Competition

The next step is to launch a competition to design and field an ISAC pilot project. This step is crucial for the U.S. government to validate the feasibility of receiving ISAC services from commercial 6G networks. This step also provides commercial firms an opportunity to build advanced networks and test the commercial viability of the services they would deliver. A pilot competition might be structured with the phases described in Table 4.

Phase 0: Establish Program

A pilot competition should begin with the U.S. government establishing its LFA with the authority to grant spectrum and provide R&D funding, loans, and other nonfinancial incentives. The LFA must also be given the authority and funding to task the U.S. government laboratories that will ultimately test and validate competitive proposals.[50] This would also be a natural point in the action plan to invite allied governments to join the partnership. At a minimum, these countries could act as observers of and advisers to this effort. They might also offer their own experts, as well as facilities and networks, to test prototypes.

The metropolitan statistical area chosen for the pilot project is crucial: It must present a lucrative market opportunity for commercial firms. Specifically, the pilot deployment site needs to have enough people and economic activity for commercial firms to make money selling 6G-delivered platforms and services. If these services prove commercially viable in the first test market, commercial firms would be encouraged to scale them across the country. The pilot location should also include critical civilian infrastructure and U.S. government sites that need to be protected from drones and other air threats.[51] Table 5 depicts the top ten metropolitan statistical areas by population and gross domestic product.

The output of Phase 0 would be an established LFA program office and authorities, architecture guidelines for needed ISAC services, the plan for U.S. government laboratories to test and validate prototypes, partnerships with allied countries, and the specific location for the ISAC pilot project.

Phase 1: Solicit Commercial Proposals

One of the LFA's first responsibilities would be to solicit proposals from commercial firms to provide the ISAC services needed. When talking to best-in-class commercial firms about new initiatives, DOW needs to use the language of the technology industry. This usually requires ample market research to prepare for any solicitation of this kind. This includes requests for information, industry days, and a lot of interaction to shape the form of contracting that will be used. All of this might be thought of as a natural part of solicitation, but it will require an elevated

TABLE 4

Notional Integrated Sensing and Communications Pilot Competition Phases and Outputs

Phase	Description	Key Outputs
Phase 0: Establish program	• LFA established • Spectrum grants and other incentives authorized • Pilot specified, U.S. government laboratories tasked	• LFA office and authorities • Architecture guidelines • Laboratory plan • Pilot location
Phase 1: Solicit commercial proposals	• LFA defines high-level requirements and KPIs and offers incentives • Commercial firms sprint to define architecture and prototype components	• U.S. government requirements, KPIs, and offerings • Competitor architectures and prototypes
Phase 2: Virtual prototype competition	• Teams test prototypes in U.S. government simulation environments • Assess performance and conduct stress tests for interference, clutter, false alarms	• Prototype deliveries • Lab validations • Top two to five finalists chosen
Phase 3: Full prototyping and laboratory evaluation	• Teams deliver full systems to U.S. government laboratory for testing, including RAN and core hardware, edge components, and control and user software	• Performance scores • Compliance validation • Interoperability assessment
Phase 4: Field pilots	• Finalists deploy systems in designated areas (e.g., urban centers, critical infrastructure, military facilities) for real-world testing	• Real-world performance, interoperability, and scalability assessment • Rankings
Phase 5: Choose winning systems	• U.S. government selects winner and runner(s)-up to scale for national deployment on the basis of pilot program's performance, interoperability, and scalability	• Awarded contract(s) • Deployment road map

NOTE: KPI = key performance indicator.

TABLE 5

Top Metropolitan Statistical Areas, by Population and Gross Domestic Product

Rank	Metropolitan Statistical Area	Population (2025, estimated)	Regional Gross Domestic Product (2024, estimated)
1	New York–Newark–Jersey City, NY-NJ-PA	19,940,000	$2.45 trillion
2	Los Angeles–Long Beach–Anaheim, CA	12,927,000	$1.38 trillion
3	Chicago-Naperville-Elgin, IL-IN-WI	9,408,000	$932 billion
4	Dallas–Fort Worth–Arlington, TX	8,344,000	$788 billion
5	Houston-Pasadena–The Woodlands, TX	7,796,000	$707 billion
6	Miami–Fort Lauderdale–West Palm Beach, FL	6,458,000	$555 billion
7	Washington-Arlington-Alexandra, DC-VA-MD	6,436,000	$771 billion
8	Atlanta–Sandy Springs–Alpharetta, GA	6,411,000	$606 billion
9	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	6,330,000	$590 billion
10	Phoenix-Mesa-Chandler, AZ	5,187,000	$415 billion

SOURCES: Features data from Bureau of Economic Analysis, "GDP by Country, Metro, and Other Areas"; Bureau of Economic Analysis, "Local Area Gross Domestic Product, 2023"; U.S. Census Bureau, "Metropolitan and Micropolitan Statistical Area Population Totals and Components of Change."

kind of market research. It is worth emphasizing the importance of *not* using traditional federal solicitation methods to attract the kinds of commercial firms that DOW will need to make this COA work in practice.

The LFA should define high-level operational requirements and KPIs to commercial participants. Commercial teams competing for these incentives should begin their sprint by defining their system architectures, prototyping algorithms and new network components, and drafting plans to integrate their algorithms and new components with existing networks. The output of Phase 1 would be commercial teams responding with viable architectures, integration plans, and virtual prototypes that are accepted into the competition.

Ideally, several commercial teams would compete for the spectrum, loans and R&D funding, and other incentives the U.S. government offers in return for ISAC services. One team might be Nvidia, T-Mobile, Nokia, and other partners already working together to build an AI-native RAN stack in the United States. Other teams could be led by Alphabet, Amazon Web Services, Microsoft, Meta, IBM, xAI, or other companies that are able to act as systems integrators. AT&T, Verizon, and T-Mobile participation on each team would be crucial, either as members of one or more teams or as neutral providers across teams. Onshored subsidiaries or affiliates of Ericsson, Nokia, and Samsung, as well as U.S.-based component makers, would provide RAN and core network software and hardware and play key roles in product innovation.

To encourage allied participation, special arrangements could be made to extend team membership to trusted offshore industrial partners. For example, Ericsson, Nokia, and Samsung might partner with their U.S. subsidiaries or affiliates or Deutsche Telekom with T-Mobile. Security agreements and special technology-sharing arrangements could be made in advance to protect especially critical software and hardware from compromise or exploitation.

Phase 2: Virtual Prototype Competition

Once the LFA has received proposals from commercial firms, the teams that the LFA deems to be viable will be accepted into the prototype competition.

> When talking to best-in-class commercial firms about new initiatives, DOW needs to use the language of the technology industry.

These teams will test their virtual prototypes in U.S. government laboratories, including those operated by the National Telecommunications and Information Administration, the National Institute of Standards and Technology, DOW, and the U.S. Department of Energy. The government laboratories would make up a distributed simulation environment that would assess system performance against the established KPIs and conduct stress tests, including for interference, clutter rejection, and false alarm rates. Teams that cannot deliver viable prototypes would be eliminated from the competition. The output of Phase 2 would be the delivery of virtual prototypes from each team, laboratory validation and assessments, and the choosing of the top two to five teams to advance to Phase 3.

Phase 3: Full Prototyping and Laboratory Validation

Teams advancing to Phase 3 would deliver full prototypes to U.S. government laboratories for performance assessment and to validate prototypes' compliance with all operational requirements. Prototypes would include new RAN hardware components as needed, edge compute, and all core and application software. A key aspect of the laboratory tests will be the integration of each prototype with existing 5G and 6G network infrastructure. The output of Phase 3 would be performance scores for each prototype against the KPIs, requirements compliance validation, and an assessment of prototype interoperability with existing networks. Teams delivering full

prototypes that meet KPIs and operational requirements would advance to Phase 4.

Phase 4: Field Pilots

Finalists would deploy their systems into designated portions of the pilot project location. These would be arranged to cover key population areas, critical civilian infrastructure, and military facilities. The LFA would conduct tests to assess system performance in this environment with a variety of simulated threats in the presence of real-world air traffic. Each system could also be evaluated on its efficient use of spectrum and seamless coexistence with other users. Outputs of Phase 4 would include a rigorous assessment of physical system performance in a real-world setting, the interoperability of each competitor's system with existing networks, and an assessment of the systems' scalability to a national level.

Phase 5: Choose Winning Systems

Teams successfully meeting the operational requirements, demonstrating interoperability and scalability, and complying with all regulations would be awarded contracts to scale their systems up to national deployment.

Scale Up to National Deployment

The U.S. government could award national contracts to the winning Phase 5 teams in the following ways:

1. **Winner takes all.** The team scoring highest on performance and interoperability wins the national contract. Other teams would be encouraged to work as subcontractors.
   - Pro: One prime contractor would be responsible for addressing problems when they arise.
   - Con: The winning team may become an entrenched monopoly that slows 6G progress rather than speeding it and stifles any innovations that threaten its position.
2. **Award each successful team a different region in which to deploy its system.**
   - Pro: This keeps all successful systems in the game, providing some diversity and competition in 6G markets.
   - Con: This may result in a feudal system with smaller versions of the same monopoly problems as in Option 1. Integrating these systems across regional boundaries is almost certain to be a significant challenge.
3. **Hybrid.** Choose the team with the highest interoperability and performance scores to serve as the lead national system integrator. The lead and the other winning team(s) would be eligible for an initial share of each region commensurate with their scores, and the lead team would receive the biggest overall share. Over time, shares of each region would be examined and could be reallocated based on the performance of each team.
   - Pro: This maintains competition in each region while assigning a lead team to integrate systems within and across regions.
   - Con: This requires continued U.S. government oversight to ensure that performance continues to meet requirements and that there is proper execution of lead system integrator duties.

Each system could also be evaluated on its efficient use of spectrum and seamless coexistence with other users.

The yearlong phases for scaling to a national system might roughly be as follows:

- Year 1. Standardize: Refine operational requirements and KPIs and establish a common architecture and interfaces among winning systems.
- Year 2. Regional pilots: Launch multicity or multistate test beds and assess intraregional performance.

- Year 3. Operationalize: Create regional operations centers and implement successful regional pilots.
- Year 4. Interregional capability: Integrate regional centers into the national system.

Additional Objectives

As discussed in the introduction to this report, DOW has articulated some additional objectives related to overseas commercial networks and workforce development. These objectives could also be addressed through the pilot competition program described previously.

Ubiquitous and High-Availability Overseas Commercial Networks

Two objectives are that (1) deployed U.S. forces can access ubiquitous, secure, instant-access DOW, coalition, and commercial networks, and (2) standing commercial networks can have high availability where U.S. forces might operate.

These objectives could be addressed by inviting key allied countries to join the PPP described in the COA 5 action plan. For example, if DOW wants to plan to use commercial networks for ISAC services when deployed, it needs to be prepared to integrate its technical capabilities with those of commercial firms that provide relevant technologies to partner countries. This could be accomplished by inviting allied countries that are facing threats from drones and other hostile air vehicles to join the ISAC pilot project, as described previously. The ISAC pilot could then be used as a test bed to validate interoperability with allied networks and train their engineers. U.S. commercial firms could export advanced hardware, software, and open-source APIs to allies and friendly countries under permissive licenses.

Formal frameworks could be established to set standards for shared 6G capabilities. These could be open standards, or they could be standards shared only among the United States and its allies—much like the standardization agreement standards used by the North Atlantic Treaty Organization. The standards framework could include a trusted supplier roster to encourage competition while helping to ensure supply chain security. Certification requirements would be issued for these suppliers.

Developing an Educated and Mobile 6G Workforce for Defense and Commercial Firms

Employment in the U.S. telecommunications sector has experienced a steady decline over the past several decades. This has raised concerns that the technical workforce needed to build advanced 6G networks will be lacking. Although many of the needed hardware and software skills are being maintained in the information technology industry led by U.S. hyperscalers, technical areas specific to radio systems and signal processing might still experience shortages.

Federal and state government programs to enhance worker education and mobility can be part of the solution. For example, the federal government has a Regional Technology and Innovation Hubs initiative that could partner with local employers, universities, community colleges, and economic development agencies to establish 6G workforce hubs. Some of this funding could be invested in high school science, technology, engineering, and mathematics programs and teacher upskilling. Bachelor's and associate's degrees and other certification programs could be funded in radio frequency engineering, signal processing, and other 6G tech skills.

Workforce mobility could also be improved by providing tax credits or grants for workers who relocate to regions needing more individuals with 6G skills. Workforce mobility could be further enhanced by reducing the use of noncompete clauses within the technology industry and by providing tuition assistance for upskilling. A focused visa program could also be used to bring in highly specialized workers.

Another opportunity is to enhance transition programs for veterans. The veteran population is a reliable source of high-quality employees with a strong work ethic and ability to quickly acquire new skills. Some programs exist to match veterans with post-service employment, and analyses in both 2023 and 2025 have pointed out ways to improve such programs' effectiveness.[52]

Conclusion: A Partnership Between the U.S. Government and the U.S. Technology Industry Is the Best Course of Action to Meet Department of War Objectives

A PPP between the U.S. government and the U.S. technology industry (following a combination of COA 3 and COA 5) is the best COA to meet DOW goals articulated in this report. A U.S. government partnership with commercial teams could provide DOW with high-priority services, such as ISAC. This partnership could also help commercial teams build advanced networks providing profitable services to consumers, businesses, and government agencies. This partnership should include governmental agencies and companies from allied countries to expand interoperable 6G ecosystems everywhere U.S. forces might operate.

Delivering ISAC over commercial networks will require choreographing sensing and communications signals so they can coexist seamlessly. Deploying ISAC and other services nationwide will require competing teams to integrate the operations of their individual hardware and software systems. This presents an opportunity to develop networks in a way that meets the DOW objectives of "agile spectrum use" and "open commercial RAN solutions including virtualized hardware and open-source software."[53] Although commercial firms should be empowered to design and build the networks to be profitable businesses, the U.S. government should monitor their deployment to ensure the spirit of its objectives is met.

Workforce mobility could also be improved by providing tax credits or grants for workers who relocate to regions needing more individuals with 6G skills.

Although not guaranteed, a partnership between the U.S. government and the technology industry could help make the United States a RAN innovation leader. The platforms and services envisioned by Big Tech would require advanced RAN networks to deliver them. As Big Tech grows its markets, it would likely boost demand for advanced 6G hardware and software. As a result, onshore U.S. component makers and onshore subsidiaries or affiliates of Ericsson, Nokia, and Samsung might have an opportunity to establish a lead in 6G technologies.

If the U.S. government deems that the R&D activities and software developed by this partnership are vulnerable to theft and cyber exploitation, it might need to take additional actions. These could include onshoring more of the activities of Ericsson, Nokia, and Samsung through subsidiaries or affiliates (COA 3). Onshoring activities funded in part or wholly by the U.S. government would ensure that subsidiaries or affiliates providing RAN equipment to U.S. mobile networks operate under U.S. laws and regulatory oversight. Agreements could be arranged to share the technological advances made by these subsidiaries or affiliates with their offshore parent companies.

DOW also wants ubiquitous, secure, and instant access to coalition and commercial networks around the globe, including for use by expeditionary and tactical forces. As advanced 6G networks are deployed, they will present an opportunity for the United States to extend its partnership with its allies and other security partners. Under this partnership, the United States could export advanced hardware, software, and APIs under permissive licensing arrangements to ensure that advanced networks are available to support U.S. and coalition operations. The United States could also export technologies that provide ISAC and other defense-related services to key allies.

Finally, the PPP could also be expanded to help ensure a skilled workforce continues to be developed. Regional commercial groups and academic institutions could be engaged to provide 6G-related education and training programs. At the national level, the Department of Labor could strengthen programs to speed the transition of veterans from the military to

civilian 6G-related occupations. Other Department of Labor, Department of Education, Department of Commerce, and National Science Foundation programs could be refocused to improve the education, training, and mobility of 6G-related workers.

At the national level, the Department of Labor could strengthen programs to speed the transition of veterans from the military to civilian 6G-related occupations.

Appendix. Radio Frequency Spectrum Allocations

Table A.1 describes the frequency bands allocated for communications and radar, the range of frequencies in each band, the amount of bandwidth available, and some examples.[54] The examples represent just a few of the more-well-known uses. Interested readers should consult the FCC online table of frequency allocations to gain a full appreciation for the complexity of bandwidth allocations and the crowd of users within each of the frequency ranges listed.[55]

The first bands listed are *VHF* (covering the frequencies from 30 to 300 MHz) and *UHF* (covering frequencies from 300 MHz to 1,000 MHz). These frequencies host many communications users, including traditional wireless (or free over-the-air) television and amplitude modulation (AM) and FM radio broadcasts. Nonterrestrial users include the U.S. Navy's Mobile User Objective System (MUOS) satellites.

The *L-band* is the name given to frequencies from 1 to 2 GHz, containing a total bandwidth of 1,000 MHz (or 1 GHz). Terrestrial communications users include mobile cellular systems. Nonterrestrial users include the Iridium satellite constellation, which has been allocated 10 MHz of bandwidth for uplink and downlink communications, and the Global Positioning System (GPS) to downlink timing signals. Radar users include Air Route Surveillance Radar for en route air traffic control (the FAA) and air sovereignty and homeland defense (North American Aerospace Defense Command).[56] These frequencies are also used for long-range military early-warning radars.

The *S-band* is the name given to the frequencies from 2 to 4 GHz, containing 2,000 MHz of bandwidth. Example terrestrial communications uses of the L- and S-bands include radio navigation systems and second-, third-, and fourth-generation of telecommunications mobile systems, as well as 5G

TABLE A.1

U.S. Frequency Band Definitions and Exemplar Communications Uses

Band[a]	Frequency Range[b]	Bandwidth	Exemplar Communications Uses	Example Radar Uses
VHF	30 to 300 MHz	270 MHz	Digital TV, FM radio	—
UHF	300 to 1,000 MHz	700 MHz	Digital TV, MUOS[c]	—
L	1 to 2 GHz	1,000 MHz	Mobile cellular, GPS,[d] Iridium[e]	Early warning/search
S	2 to 4 GHz	2,000 MHz	Mobile cellular, TDRS[f]	Acquisition/track
C	4 to 8 GHz	4,000 MHz	Mobile cellular, SATCOM[g]	Multifunction
X	8 to 12 GHz	4,000 MHz	SATCOM: 500 MHz[h]	Fire control
Ku	12 to 18 GHz	6,000 MHz	Microwave towers, GEO, LEO SATCOM[i]	Fire control
Ka	18 to 40 GHz	32,000 MHz	Mobile cellular, SATCOM[j]	Missile seeker

SOURCES: Features information from the National Telecommunications and Information Administration, "Federal Spectrum Use Summary"; and the list of sources below.
NOTE: GEO = geosynchronous orbit; SATCOM = satellite communications; TDRS = tracking and data relay satellites.
[a] See NASA, "Communications."
[b] See FCC, "Table of Frequency Allocations Chart."
[c] See Oetting and Jen, "The Mobile User Objective System."
[d] See Time Realization and Distribution Group, "Time and Frequency from A to Z, G."
[e] See SMTS, "Iridium Communication Services."
[f] See Powers, "Tracking and Data Relay Satellites (TDRS)."
[g] C-band satellites long held bandwidth allocations of 500 MHz for uplink and 500 MHz for downlinks. Recently, the United States and other nations have reallocated 300 MHz of the downlink bandwidth for 5G cellular systems. However, most C-band satellites still have 500 MHz of uplink capacity built into them, and it might be possible for the Baltic states to use that uplink capacity in wartime. For a discussion of C-band allocations, see Lagunas et al., "5G Cellular and Fixed Satellite Service Spectrum Coexistence in C-Band."
[h] See U.S. Space Force, "Wideband Global SATCOM Satellite."
[i] See Magallanes, "Looking for Capacity Options in Extended Ku-Band Segment."
[j] See Christensen, "ITU Regulations for Ka-Band Satellite Networks."

mobile cellular systems. Nonterrestrial communications users include the TDRS system operated by NASA. Radar users include midrange surveillance around airports. Military systems use the S-band and the C-band (described next) for multifunction radars that can track multiple targets simultaneously and cue weapon systems.[57]

The *C-band* is the name given to frequencies from 4 to 8 GHz, containing a total of 4,000 MHz of bandwidth. In the United States, communications satellites have traditionally been allocated 500 MHz of this bandwidth for uplinks from ground stations and another 500 MHz of bandwidth for downlinks from the satellites back to the ground stations. (A somewhat bigger allocation had been given by some other countries for satellite uplinks and downlinks.) Subsequently, 300 MHz of the downlink bandwidth has been reallocated for use by 5G mobile cellular systems (sometimes referred to as the *sub–6 GHz* band in the 5G community). This reduces the capacity of C-band SATCOM down to earth. (However, it might still be possible to use the full uplink capacity of existing C-band satellites if the uplink transmissions are sufficiently directional or shielded to prevent interfering with adjacent 5G base stations.) As mentioned previously, the C-band is used for multifunction radars that can track multiple targets simultaneously and cue weapon systems.

The *X-band* is the name given to the frequency range from 8 to 12 GHz, containing 4,000 MHz of bandwidth. These frequencies are used for communication by such U.S. military satellites as the Wideband Global Satellite (WGS), but commercial satellites have not historically operated in this range. The WGS is allocated 500 MHz of X-band for uplink communications and another 500 MHz for downlink communications to users operating on the earth's surface or the airspace above it. X-band frequencies would also be good frequencies for terrestrial communications users but are barred from consideration in the United States.[58]

The *Ku-band* is the name given to frequencies in the 12 to 18 GHz range, containing 6,000 MHz of bandwidth. In the United States, commercial communications satellites in GEO have been allocated 500 MHz of bandwidth for uplinks to satellites and another 500 MHz for downlinks to earth terminals. However, other countries have allocated an extended Ku-band with 750 MHz of uplink and downlink bandwidth. The Starlink constellation operating in LEO has been allocated 500 MHz of bandwidth for uplinks but has also been allocated 2,000 MHz of bandwidth for downlinks to user terminals. Terrestrial communication uses include microwave towers, radars, navigation, and radio astronomy. Military uses include fire control radars.

The *Ka-band* is the name given to frequencies from 18 to 40 GHz, containing 32,000 MHz (or 32 GHz) of bandwidth. Please note that the designated frequency ranges of the higher bands vary somewhat among sources; here, we use the International Telecommunications Union designation of Ka as the combination of K and Ka frequencies.[59] Commercial communications satellites have been allocated 3,500 MHz of bandwidth for uplinks to satellites and downlinks to user terminals. The WGS system has been allocated 1,000 MHz of Ka bandwidth. Terrestrial communications users of this frequency range include short-range 5G mobile services. These frequencies are also used by miniature radars onboard missiles that serve as missile seekers.

Notes

[1] The Department of War is designated the Department of Defense under Public Law 81-216, National Security Act Amendments of 1949.

[2] Rondeau, "FutureG Strategic Roadmap."

[3] See Rondeau, "FutureG Strategic Roadmap."

[4] The People's Republic of China plans to provide $1.5 trillion in *guidance funds* to Chinese companies to "catch up with and surpass" the United States. Dominating the rollout of 6G is among China's top priorities, so the telecommunications industry has received a significant share of these funds. In addition, the People's Republic of China has given tens of billions of dollars to Huawei and other telecommunications companies to invest in R&D and underbid competitors. Huawei alone has received up to $75 billion since its founding. See Luong, Arnold, and Murphy, *Understanding Chinese Government Guidance Funds*; Creemers et al., "Translation: 14th Five-Year Plan for National Informatization"; Ma, "Goal for 2023"; Berman, Maizland, and Chatzky, "Is China's Huawei a Threat to U.S. National Security?"; and Kuo, "'Wireless Wars.'"

[5] "Huawei Strengthens Leadership in RAN Market," Telecom Lead; Fletcher, "Huawei Still Dominates Telecom Equipment Market"; Weissberger, "Omdia"; Dell'Oro Group, "RAN Equipment Market to Remain Uninspiring, According to Dell'Oro Group"; Pascal, "Market Landscape."

[6] See Tomás, "China 5G Rush"; and Jiang and Perez, "China to Introduce Early 6G Mobile Applications by 2025, Putting the Country on Track to Rolling Out Commercial Services by 2030."

[7] See Ford, "Wireless Infrastructure by the Numbers"; Steel in the Air, "5G Cell Towers in 2024"; and CTIA, "5G in America."

[8] AT&T, T-Mobile, and Verizon each carry more than $100 billion in debt, about equal to their annual revenue.

[9] See Dell'Oro Group, "RAN Equipment Market to Remain Uninspiring, According to Dell'Oro Group"; Dano, "America's 5G Spending Slowdown Proves Bigger Than Expected"; and 5G Americas, *5G-Advanced Overview*.

[10] The United States leads the world in cloud data and compute services, comprising approximately 70 percent of the global market. The United States also has more data centers than any other nation and leads in Internet of Things connections. See Synergy Research Group, "Cloud Market Share Trends"; Taylor, "Number of Data Centers Worldwide as of November 2025, by Country or Territory"; and Taylor, "Number of IoT Connections in North America in 2018, 2019 and 2025."

[11] See U.S. Department of War, *NDS*.

[12] In this report, *onshoring* refers to the practice of moving the development and manufacturing of RAN equipment from foreign countries (*offshore* locations) into the United States.

[13] All U.S. RAN manufacturers are small in terms of sales. Mavenir has dropped hardware production after losing about $1 billion, and other U.S. RAN manufacturers have retreated to market niches. See FactSet, homepage; Dyer, "Mavenir Drops a Billion in Debt"; Morris, "Open RAN Players Are in Retreat, Losing Market Share Last Year"; Ericsson, "Ericsson Reports Fourth Quarter Results and Full-Year Results 2024"; Macrotrends, "Ericsson Net Income/Loss 2012–2026"; Nokia, "Nokia Corporation Financial Report for Q4 and Full Year 2024"; and Macrotrends, "Nokia Net Income 2012–2025."

[14] "Telefonaktiebolaget LM Ericsson (ERIC) Market Cap," webpage; Macrotrends, "Ericsson Total Assets 2012–2026"; Companies Market Cap, "Ericsson (ERIC)"; Bonilla, "BAE Systems, Inc. Announces Leadership Transition on Board of Directors."

[15] See FCC, "FCC Updates Covered List to Include Foreign-Made Consumer Routers, Prohibiting Approval of New Models"; and Hill, "Everything You Need to Know About the Foreign-Made Router Ban in the US."

[16] Other commentators have pointed out the vulnerabilities inherent in using Chinese-made equipment. Moreover, there is a weakness in the U.S. strategy to compete with China over the long term if China can offer a complete package to provide advanced capabilities, such as AI, in global markets, and the United States cannot. (For example, see Anderson, "The U.S. Needs to Go on AI Offense.") A full-stack AI package includes the chips and developer tools and also includes cloud capabilities, financing, and the infrastructure to deploy AI to the edge. In our analysis, we share Jensen Huang's view that telecommunications are the "digital nervous system of our economy and security." That "digital nervous system" will increasingly rely on 6G networks. See Heuer, "NVIDIA, Nokia Planning $1B, Global-Leading 6G AI Platform."

[17] The BABA Act was enacted as Division G, Title IX, of the Infrastructure Investment and Jobs Act (Pub. L. 117-58).

[18] Under the BABA Act, the final assembly of RAN hardware and 55 percent of its hardware and software content production must be performed in the United States if purchased as part of the BEAD Program. See National Telecommunications and Information Administration, "Build America Buy America"; and White House, "Key Provisions in the Build America, Buy America Act Guidance."

[19] Public Law 117-167, An Act Making Appropriations for Legislative Branch for the Fiscal Year Ending September 20, 2022, and for Other Purposes; this is referred to as the CHIPS (Creating Helpful Incentives to Produce Semiconductors) and Science Act.

[20] Public Law 81-774, Defense Production Act.

[21] Public Law 115-390, Strengthening and Enhancing Cyber-Capabilities by Utilizing Risk Exposure Technology Act.

[22] Public Law 81-774, Defense Production Act.

[23] Public Law 111-383, Ike Skelton National Defense Authorization Act for Fiscal Year 2011.

[24] Public Law 115-232, John S. McCain National Defense Authorization Act for Fiscal Year 2019, Section 889, Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment; Public Law 117-263, James M. Inhofe National Defense Authorization Act for Fiscal Year 2023.

[25] Public Law 119-60, National Defense Authorization Act for Fiscal Year 2026.

[26] Executive Order 13873, "Securing the Information and Communications Technology and Services Supply Chain."

[27] Executive Order 14017, "America's Supply Chain."

[28] See BAE Systems, "Who We Are"; Hepher, "Analysis"; and BAE Systems, "Special Security Agreement."

[29] See FCC, "FCC Updates Covered List to Include Foreign-Made Consumer Routers, Prohibiting Approval of New Models"; and Kan, "FCC Router Ban Is Bad News for These Brands."

[30] It is possible that Ericsson and Nokia might choose to onshore the R&D, software, and hardware produced for U.S. networks in the hope of winning contracts that would be partially funded with U.S. government money. In that case, the cost to the U.S. government to incentivize onshoring would be zero. On the other hand, Ericsson and Nokia might demand an investment commensurate with the market value associated with their U.S. sales. The United States accounts for an estimated 40 percent of Ericsson's and 25 percent of Nokia's total RAN sales. These companies might attribute a similar portion of their total market value to their U.S. sales. A 50–50 partnership with the U.S. government would then come to $17 billion. This includes a 50-percent equity stake in Ericsson U.S., a 50-percent equity stake in Nokia U.S., and 50 percent of the R&D associated with their U.S. markets over the five-year period through 2030.

[31] Nvidia, "NVIDIA and Nokia to Pioneer the AI Platform for 6G."

[32] See Nvidia, "NVIDIA and US Telecom Leaders Unveil the All-American AI-RAN Stack to Accelerate the Path to 6G"; and Morris, "Nokia and Nvidia's AI-RAN Plan Hits Telco Resistance."

[33] See Field, "Zuckerberg Prepares to Abandon Metaverse Dream."

[34] See Dano, "AWS Kills Private 5G Offering That Competed with Carriers"; Morris, "Microsoft to Quit Affirmed and Metaswitch in Telecom Retreat"; and Google Cloud, ""Ericsson and Google Cloud Team Up to Deliver Carrier-Grade 5G Core-as-a-Service, Built with AI at the Foundation."

[35] See Farrar, *Satellite Direct-to-Device*.

[36] See Performance.gov, "FY 16–17: Agency Priority Goal"; Sheetz, "NASA Chief Says Competition Is Making Space Exploration Cheaper, in Dramatic Shift on Contracts"; Smith, "SpaceX's Market Share in the Commercial Space Launch Industry"; and NASA, Office of the Inspector General, *NASA's Transition of the Space Launch System to a Commercial Services Contract*.

[37] See European Commission, "The Smart Networks and Services Joint Undertaking"; Suzuki, "Japan Readies $2bn to Support Industry Research on 6G Tech"; Hirosawa, "Japan to Earmark $450m for Next-Gen 6G Research Fund"; Valerio, "China Sharpens Strategy in the Global 6G Race"; and Luong, Arnold, and Murphy, *Understanding Chinese Government Guidance Funds*.

[38] For an historical example of such partnership arrangements with allies, see Camm, *The F-16 Multinational Staged Improvement Program*.

[39] A useful approach would be to work with allies and partners to build a full stack of AI-6G ecosystem and fast-track needed exports to trusted partners. This could include the components of ISAC to extend drone detection and tracking capabilities to allied countries.

[40] Integrated sensing is one of the key capabilities offered by 6G, while ISAC is named as a FutureG Strategic Line of Effort (Rondeau, "FutureG Strategic Roadmap," p. 10) and a Priority Effort (Rondeau, "FutureG Strategic Roadmap," p. 12). Using ISAC to detect and track drones has gained a new urgency from the massive use of combat drones by both sides in Russia's war on Ukraine. Iran's manufacture and use of drones adds a new dimension as a military and terror threat.

[41] See the appendix for a list of frequencies and example uses.

[42] See O'Donoughue, Zhang, and Crawford, *More Than Just a Radar*, for a more complete assessment of using commercial communications networks as a passive coherent location radar network. For publicly available descriptions, see Kumar Rai et al., "LTE-Based Passive Radars and Applications"; and Wypich and Zielinski, "Experimental Evaluation of 5G NR OFDM-Based Passive Radar Exploiting Reference, Control, and User Data."

[43] The C-band frequencies between 3.7 and 3.98 gigahertz (GHz) that were leased in spectrum auction 107 would be good for this purpose. Frequencies above 4 GHz are also used for targeting-quality radar tracking signals. For a brief tutorial on radar bands, see Lockheed Martin, "What Is a Radar Band and Why Is It Important?"

[44] A minimum of four towers are needed to receive reflected radio signals to track each target, and additional towers are needed to hand over tracks as the targets move out of range of the initial group of four towers. Past analyses have indicated that high-quality location and tracking can be accomplished with only 25 percent of the available towers in rural areas, thus having a relatively low density of cell towers. In high-density urban areas, an even sparser matrix of ISAC-equipped cell towers might suffice for receiving signals. See Bonds et al., *Harnessing 5G-Era Innovations*. Even fewer towers should need the ability to radiate for targeting.

[45] We based this initial list of authorities and capabilities on recent U.S. government efforts to address the need for better awareness of drones in U.S. airspace. See Lopez, "Dozens of Federal Agencies Initiate Counter-UAS Collaboration"; FCC, "FCC Seeks Comment on Unleashing American Drone Dominance"; Nexsen, "FCC Seeks Comment on Accelerating American Drone Industry"; Lockheed Martin, "Startup Speed, Mission Focus"; Soomra and Norton, "Integrated Sensing and Communications for Small UAV Applications in Cellular Networks"; and Bielby, "Multi-Agency Advisory Claims to Clarify Safe and Legal Use of Drone Detection Technology."

[46] The Wireless Infrastructure Association reported that there were 455,000 macrocell and other outdoor cell sites at the end of 2024, including 15,000 new sites that were activated that year. Assuming linear growth, that would yield 520,000 sites on January 1, 2030. The FCC estimates that the cost to outfit a site with wideband radios and edge compute as between $250,000 and $500,000. This estimate does not include specialized radars or other sensors to detect and track drones because the concept described in this document would use the cell sites' organic equipment for detection and tracking. See Ford, "Wireless Infrastructure by the Numbers"; FCC, Secure and Trusted Communications Networks Reimbursement Program, *Final Catalog of*

Eligible Expenses and Estimated Costs; and CTIA, *2025 Annual Survey Highlights*.

[47] Spectrum prices at recent auctions ranged from $0.22 per MHz-population to $0.94 per MHz-population. See Digital Twin Sim, "CBRS Auction 105"; Alleven, "FCC Closes Historic 3.45 GHz Auction at $21.8B"; and Alleven, "C-Band's First Phase Tops Charts with $80.9B."

[48] See FCC Public Reporting System, "Auction 107."

[49] For example, the FCC accused Dish Network of "warehousing" licenses that it had purchased and threatened to revoke the licenses concerned. Meanwhile, the services promised over this spectrum were not delivered to users. See Spiwak, "The Curious Case of Brendan Carr Versus EchoStar"; and Alleven, "EchoStar Gets More Time to Meet 5G Buildout Requirements."

[50] The LFA might lean heavily on Other Transaction Authorities to streamline the prototype project. For a helpful look at Other Transaction Authorities, see Mayer et al., *Prototyping Using Other Transactions*.

[51] Especially vulnerable civilian infrastructure might include oil refineries and data centers. Vulnerable U.S. government facilities include the Capitol building, the Supreme Court building, the White House, the Pentagon, and other centers of the three branches of government. U.S. air bases and other military facilities might also feature on this list. For lists of examples, see Oil Sands Magazine, "U.S. Refineries"; Data Center Magazine, "USA Data Centers"; and Military.com, "Air Force Base Guide." For an example of an especially detailed assessment, see Schnaubelt et al., *The Army's Local Economic Effects: Appendix B, Volume I*; and Schnaubelt et al., *The Army's Local Economic Effects: Appendix B, Volume 2*.

[52] For two analyses, see Wenger, Hastings Roer, and Wong, *Military-to-Civilian Occupational Matching*; and Strong and Wenger, *Translating Military Skills into Energy and Infrastructure Careers*.

[53] Rondeau, "FutureG Strategic Roadmap."

[54] The appendix has been adapted from a previous RAND report. See Bonds et al., *Harnessing 5G-Era Innovations*.

[55] FCC, "Table of Frequency Allocations Chart."

[56] Healy et al., *Air Route Surveillance Radar Model 4 (ARSR-4) Operational Test and Evaluation (OT&E) Final Report*.

[57] For example, see Lockheed Martin, "What Is a Radar Band and Why Is It Important?"; Leonardo DRS, "What Are S- and X-Band Radar and How Are They Used Today?"; and Kopp, "Engagement and Fire Control Radars (S-Band, X-Band, Ku/K/Ka-Band."

[58] See Neenan, "NTIA, Industry Eyeing 4.4 GHz for Commercial Use."

[59] International Telecommunication Union, "Nomenclature of the Frequency and Wavelength Bands Used in Telecommunications."

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Abbreviations

5G	5th generation of telecommunications
6G	6th generation of telecommunications
AI	artificial intelligence
API	application program interface
AR	augmented reality
BABA	Build America, Buy America
BEAD	Broadband Equity, Access, and Deployment
CBRS	Citizens Broadband Radio Service
COA	course of action
CU	centralized baseband unit
DOW	U.S. Department of War
DU	distributed baseband unit
EMP	electromagnetic pulse
FCC	Federal Communications Commission
FM	frequency modulation
GEO	geosynchronous orbit
GHz	gigahertz
GPS	Global Positioning System
ISAC	integrated sensing and communications
KPI	key performance indicator
LEO	low earth orbit
LFA	lead federal agency
MHz	megahertz
MUOS	Mobile User Objective System
NASA	National Aeronautics and Space Administration
NDAA	National Defense Authorization Act
PPP	public-private partnership
R&D	research and development
RAN	radio access network
rApp	real-time application
RIC	RAN Intelligent Controller
SMO	systems management and orchestration
SSA	special security agreement
TDRS	tracking and data relay satellites
UHF	ultra high frequency
VHF	very high frequency

About This Report

The FutureG and Technology Industrial Base Assessments offices within the Office of the Under Secretary of War for Research and Engineering asked RAND to assess the U.S. mobile wireless network equipment industrial base. The objective, as stated in the *FutureG Strategic Roadmap*, was to "assess the readiness of the U.S. commercial wireless network equipment industrial base to viably **re-establish U.S. commercial wireless network equipment production and scale** at a level necessary to compete with incumbent Tier 1 providers, such as Ericsson, Nokia, Samsung, and Huawei in three to five years" and provide "**recommendations for specific courses of action** available to federal entities to mitigate risks of future paths and address the [U.S. Department of War (DOW)] objectives."

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For more information on the RAND Acquisition and Technology Policy Program, see www.rand.org/nsrd/atp or contact the director (contact information is provided on the webpage).

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