Policy Issues for Telecom Transformation
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High speed networks are the key to future economic growth in the US. The technologies that underpin high speed networks are at the cusp of change as we move further into 5G deployment and look ahead to new network technologies. There are several significant changes as telecom and "compute" integrate and cloud technologies, "edge" computing and artificial intelligence increase their role in telecom. The 5G/6G transition, which will accelerate in less than a decade, is the most significant infrastructure issue facing the US today.

The transition creates new challenges for policy-makers in supply chain, spectrum, and infrastructure. The US has done well in managing the challenges 5G presented for spectrum management and supply chain security. Similar challenges will arise for 6G, which is expected to build on the 5G infrastructure, accompanied by additional questions raised by Open Radio Access Networks (ORAN), and regulatory issues posed by artificial intelligence, cloud computing, and cybersecurity. While the immediate issues are spectrum, supply chain, regulation, and build-out, all of these issues will require decisions by policymakers

Supply chain. Supply chain became a major concern given changes in international relations. The immediate concern was the role of China and its national champion, Huawei. Huawei used Chinese government support to damage competitors. Its presence in American telecom infrastructure gave the Chinese government an unwelcome degree of control. But Huawei, despite its claims, was always dependent on Western technology. The trust problem has been addressed through sanctions, international agreement on trustworthy supply chains and "rip-and-replace" programs.

One problem for 6G is the continued reliance on Chinese microelectronic component makers. Western producers have become accustomed to relying on lower-cost Chinese producers of less sophisticated components (transistors, capacitors, diodes, and other basic components, as well as less sophisticated chips) and there are Chinese components in every digital device. Some of the more advanced components, could be exploited by China for coercive purposes. Building products that depend on Chinese components creates political risk – either the Chinese manufacture may be caught in western sanctions or China may use the dependence to gain leverage over a western company. Further implementation of the ICTS Supply chain rule could complicate 6G sourcing. A useful long term strategy would be to diversity the microelectronic supply chain out of Chia, but this will take years to accomplish.

Huawei, with Chinese government support, hopes to reclaim its position with 6G. The US, with Japan, is well placed to compete in software, semiconductors, and AI, but China will assert itself in international standards processes and in as many markets as possible. Managing the infrastructure supply chain as China's role in it is reduced will be a major task.

Standards. This means that standard setting will be a contest, as it was with 5G. The Chinese government has learned the value of the standard setting process and seeks to control it, replacing a private sector led, technology driven process with government directed approaches. China did not succeed in 5G, but it intends to try again. Western companies still lead, but this lead is fragile and will be challenged by China and it has been difficult to develop policies that support the private sector, technology driven standards process through government action.

Spectrum. The US spectrum management process has worked well, albeit with some bumps (like the recent dispute with FAA), to reallocate spectrum to higher value uses. The FCC issued licenses for the experimental use of 6G as early as 2019 (in the 95 gigahertz to 3 terahertz) to encourage innovation and testing. 6G uses higher frequencies than its predecessors, where there are fewer incumbents but there will still be issues over allocations between licensed and unlicensed uses and (while they are fewer) with existing government and commercial uses. Additionally, there are some in Europe who believe that US support for Open RAN is intended to undercut incumbent European telecom suppliers. American official dispute this (and there is no evidence to support the allegation) but the debate creates issues for standards, supply chains, and security.

ORAN. 5G and future generations of network technology will likely use a new architecture based on virtualized networks, generic hardware, cloud computing, and standardized interfaces. Open Radio Access Networks (Open RAN). Open RAN allows a modular approach where components from different vendors can be integrated into a single network. This will change supply chain dynamics. Open Ran raises issues of scalability and standards-based integration Policy makers hope Open Ran can provide solutions to supply chain problems created by Huawei and there is debate over security, reliability, and the pace of deployment.

Edge computing. 5G lets service providers move computing power away from the telecom "core" or from cloud services to use computing and memory resources located closer to the final use. This will be beneficial for many applications that require low patency, e.g. faster processing, such as self-driving cars or telesurgery. The pandemic and he realization of the benefits of faster, more capable networks seems to have chilled concerns over edge infrastructure deployment, but other issues remain. 5G and advanced Wi-Fi move compute resources closer to where data gets created and used, but it creates new requirements for spectrum, and security.

Related Regulatory Issues. 5G/6G is part of the larger digital transformation that is reshaping economies. This transitional is a blend of next generation networks, cloud computing, and artificial intelligence. One way to think about this is that telecom and Internet protocol networks used to be separate; they are increasingly converging along the lines of networks with higher speeds, greater capacity, and a "smarter" edge that will create new services and streamline existing ones. There will be ripple effect on regulation in may sectors such as health care,

manufacturing and transportation, but the issues of immediate concern involve infrastructure related technologies

The move to 6G will likely create new requirements for privacy, trustworthiness, and sustainability. Its deployment will overlap with other tech regulation issues including anti-trust, data governance, and artificial intelligence. Regulatory outcomes in these areas will affect the supply chain for and deployment of 6G, particularly in artificial intelligence and data protection requirements. Some issues are unavoidable, as companies that inhabited the internet space move into telecom and offer similar services. There is a disparity in regulation that may need to be addressed, between the highly regulation telecom sector and the lightly regulated internet sector.

Many of these issues will be resolved by market forces and competition, but there will be unavoidable policy and legislative questions. In the move to 6G, do we need to:

-- Create industrial policies for semiconductors or other key components or provide greater support or R&D in new spectrum using technologies?

-- Strengthen cooperative technology and trade policies with Japan and Europe to ensure trustworthy supply chains, address data governance, and resolve competitiveness issues?

-- Amend spectrum allocation processes or reinforce existing authorities and agencies?

-- Expand international engagement in standards and supply chain security?

-- How could we best make use of new Federal coordinating mechanisms, such as a Telecommunications Council?

-- How do we distinguish what government needs to do and what industry needs to do to ensure rapid deployment of trustworthy 6G, noting that there can be substantial overlap in this?