



# NTIA 5G Listening Sessions Summary of Conclusions

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## Introduction

Fifth generation wireless technology (5G) will be a significant driver of our Nation's prosperity and security in the 21<sup>st</sup> century. The work to enhance the security of 5G networks will require a range of efforts from across the United States Government, working in close collaboration with our international and industry partners. The U.S. Government is committed to fostering innovation and realizing the technological promise of 5G, while continuing to safeguard our economy and national security and ensuring continued access to 5G networks.

In accordance with the Secure 5G and Beyond Act of 2020,<sup>1</sup> the Executive Branch has developed a comprehensive implementation plan associated with the National Strategy to Secure 5G.<sup>2</sup> This implementation plan is being managed under the leadership of the National Security Council and the National Economic Council, supported by the National Telecommunications and Information Administration (NTIA), and with contributions from and coordination among a wide range of departments and agencies. The implementation plan took into account the substantive responses to NTIA's Request for Comments from companies, industry associations, and think tanks representing a range of interests and aspects of the telecommunications ecosystem.<sup>3</sup>

The U.S. Government is taking a multi-pronged approach to ensure the Nation's global leadership in 5G as well as its security. This approach includes diplomatic engagements, executive actions, and public-private engagement to support industry-driven efforts. While these actions seek to secure the Nation's critical communications infrastructure, a critical challenge for the United States and its telecommunications providers is how to continue to incentivize secure and competitive 5G buildouts, and to ensure the global competitiveness of U.S. manufacturers/suppliers.

## Summary of the Listening Sessions

NTIA hosted two industry listening sessions to identify incentives and policy options to ensure that the United States has adequate sources of secure, effective, and reliable 5<sup>th</sup> and future generation wireless communications systems and infrastructure.

On January 28, 2021, NTIA held the first industry listening session, "Market Incentives for 5G Security." This listening session focused on concrete and actionable steps that the U.S. Government, in partnership with industry, can take with regard to market incentives and 5G. On February 25, 2021, NTIA held its second industry listening session, "Vendor Diversity for 5G Security," which centered on similarly specific steps that the U.S. Government, in partnership

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<sup>1</sup> Secure 5G and Beyond Act of 2020, Pub. L. No. 116-129, 134 Stat. 223.

<sup>2</sup> Exec. Branch, National Strategy to Secure 5G Implementation Plan, (Jan. 6, 2021), [https://www.ntia.gov/files/ntia/publications/2021-1-12\\_115445\\_national\\_strategy\\_to\\_secure\\_5g\\_implementation\\_plan\\_and\\_annexes\\_a\\_f\\_final.pdf](https://www.ntia.gov/files/ntia/publications/2021-1-12_115445_national_strategy_to_secure_5g_implementation_plan_and_annexes_a_f_final.pdf). For Appendices see Exec. Branch, National Strategy to Secure 5G Implementation Plan app, (Jan. 6, 2021), [https://www.ntia.gov/files/ntia/publications/5g\\_ip\\_appendices\\_1-5.pdf](https://www.ntia.gov/files/ntia/publications/5g_ip_appendices_1-5.pdf).

<sup>3</sup> Notice; Request for Public Comments, 85 Fed. Reg. 32,016 (May 28, 2020). For responses, see Comments on the National Strategy to Secure 5G Implementation Plan, NAT'L TELECOMM. & INFO. ADMIN. (June 29, 2020), <https://www.ntia.gov/federal-register-notice/2020/comments-national-strategy-secure-5g-implementation-plan>.

with industry, can take to help foster greater 5G vendor diversity. During both sessions, initial respondents provided a baseline for subsequent participants to engage in a moderated discussion of opportunities, challenges, needs, and tangible proposals that government and industry should pursue in partnership to promote vendor diversity and to advance secure 5G deployment.

The “Market Incentives for 5G Security” discussion was split into three sections: “Closing 5G Security Gaps;” “Ensuring the Viability of Domestic 5G Development;” and “Leveraging Trusted Suppliers.” NTIA Acting Assistant Secretary for Communications and Information Evelyn Remaley delivered opening remarks. Several interagency partners also participated. The Federal Communications Commission (FCC) provided an update on its actions regarding implementation of the Secure and Trusted Communications Networks Act. The National Science Foundation (NSF) provided an overview of its various 5G efforts, including the recent Spectrum Innovation Initiative in collaboration with NTIA and the FCC, international partnerships, and investment in 5G testbeds. The International Trade Administration (ITA) and the U.S. Export-Import Bank (EXIM) provided updates on their ongoing efforts with international partners.

In the section on “Closing 5G Security Gaps,” participants were encouraged to discuss 5G security gaps and how the U.S. Government and industry can best address the economic and national security risks presented by the use of 5G worldwide. The second section, “Ensuring the Viability of Domestic 5G Development,” examined how the U.S. Government can best assist the private sector in the domestic rollout of 5G technologies. The final section, “Leveraging Trusted Suppliers,” addressed which market or other incentives the U.S. Government could put in place to promote or further encourage international cooperation around secure and trusted 5G infrastructure deployment.

In each of the sessions, industry partners emphasized the need for additional government funding, particularly to assist with research and development (R&D) and testing of these new technologies, with some participants also asking for assistance on workforce training. The need for increased information sharing between government and industry on supply chain risks was another key takeaway. Updating export credit financing guidelines to include 5G equipment was another incentive that industry partners emphasized, as it is an important means to support the international competitiveness of U.S. industry. Although Open Radio Access Networks (Open RAN) is an approach to telecommunications network architecture that utilizes open interface specifications to allow for the disaggregation of network equipment, software, and services that have traditionally been bundled together by vertically-integrated vendors, industry partners disagreed as to whether government should mandate Open RAN architectures to mitigate security concerns.

Similar to the first session, the “Vendor Diversity for 5G Security” discussion was structured into three sessions: “ORAN, Open Source, and Virtualization: Opportunities and Challenges;” “Making Open and Interoperable Networks a Reality: R&D, Testing, and Other Domestic Efforts;” and “Promoting Open and Interoperable Networks in Concert with International Partners and Allies.” Acting NTIA Assistant Secretary Evelyn Remaley opened the session with a brief description of NTIA’s intentions and interest in hearing from industry. The National Economic Council followed by noting that the Biden-Harris Administration considers 5G a high priority and is committed to working with partners to support a vibrant supply chain with open

and interoperable technologies. The FCC said that secure 5G deployment is a top priority and mentioned its Notice of Inquiry on Open RAN<sup>4</sup>. The U.S. Agency for International Development (USAID) highlighted its efforts to increase 5G connectivity in the developing world, including the importance of Open RAN and network virtualization in keeping developing countries away from being locked in with Chinese vendors.

This session examined the opportunities and challenges of various technologies and policies that can help to promote 5G networks that are “open by design” and enhance vendor diversity in the 5G ecosystem. “Making Open and Interoperable Networks a Reality: R&D, Testing, and Other Domestic Efforts” explored current and potential activities necessary to promote, develop, and deploy the technologies discussed earlier, including research and development, testbeds, and other domestic policies or activities. “Promoting Open and Interoperable Networks in Concert with International Partners and Allies” identified ways in which the U.S. Government and private sector partners can promote and enhance vendor diversity and related technologies and policies internationally.

Industry participants emphasized a number of key incentives during these discussions. Government-supported research and development funding, particularly around testbeds, was highlighted several times. Although industry members cautioned that standards organizations should continue to be industry-led, several participants discussed the need for additional coordination with the government and industry on the work that occurs in these bodies. Participants also suggested that the U.S. Government increase cooperation with like-minded foreign governments on these issues.

These and other themes are explored in greater detail below.

## Major Themes

This section describes the major themes that NTIA extracted from the Listening Sessions. Each theme includes a summary statement highlighting respondents’ viewpoints. NTIA has included statements from participants to illustrate these viewpoints, paraphrased for simplicity of reading [see Appendix A for full transcripts of both sessions]. These statements are representative only; they are not intended to be exhaustive of all the responses received on a given theme, nor to perfectly capture the full substance or nuance of contributions.

### Information Sharing

**Summary:** Participants raised the need for improved information sharing on security matters between the U.S. Government and industry.

- The Competitive Carriers Association (CCA) stated that the organization’s members need clear and ongoing dialogue with the government on security; otherwise they are unable to invest confidently and securely in their networks.

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<sup>4</sup> Notice of Inquiry, 86 Fed. Reg. 16,349 (Mar. 29, 2021).

- NTCA–The Rural Broadband Association said that its members want to enhance coordination between the communications industry and government officials. Industry needs to know as soon as possible which exact security concerns the government may have. It is hard to install equipment in good faith only to be told later that it represents a national security concern. NTCA also relayed that information sharing should be two-way, so that industry can bring its concerns on equipment and software to the government.
- Rakuten spoke about the need for a comprehensive plan on 5G deployment. A long-term future-facing plan is necessary as operators are currently installing infrastructure and equipment that will be in place for the next ten to fifteen years.
- Microsoft emphasized the need for legislation to protect the private sector from lawsuits, which can prevent public-private and private-private information sharing.
- Ericsson said that supply chain integrity and security issues are key concerns. Complexity is often seen as the enemy of security, so industry efforts and government objectives need to be harmonized. 5G is the most secure wireless implementation, but there may be a gap in this respect as the transition from 4G to 5G occurs.
- The Telecommunications Industry Association (TIA) mentioned utilizing industry expertise to add transparency on existing risks in the ICT supply chain. While government has an important role to play, industry must secure its own supply chains.
- The Alliance for Telecommunications Industry Solutions (ATIS) suggested that government can spur action by the private sector by clearly articulating its needs and having a single voice to communicate them.
- Access Partnership also asked for greater cooperation across the U.S. Government to prevent industry from being inundated with requests and initiatives from separate parts of the government.
- DISH Network noted that sharing information and collaborating with industry is the best way for the United States to lead.
- The Open RAN Policy Coalition stressed three pillars: funding (such as that associated with the USA Telecommunications Act and the NTIA/Department of Defense “5G Challenge” Notice of Inquiry), public-private partnerships, and international cooperation/collaboration.

## Standards

**Summary:** The importance of the government’s role in helping to support industry engagement in standards development organizations (SDOs) was also highlighted by stakeholders.

- AT&T said that industry is taking numerous steps to secure 5G, and noted that efforts in 3GPP working groups are contributing to better security. However, it emphasized that standard setting should be led by industry, though government can play a convening role.
- Microsoft also highlighted threats to industry-led standards development organizations. The private sector and, where appropriate, the U.S. Government need to be present in standard-settings organizations given other nation-state influences on 5G standards. Microsoft identified Open RAN as an example where the United States has an opportunity to facilitate a meaningful standard.

- ATIS would like to see financial incentives for industry to make long-term commitments toward participation in international standard-setting organizations, as mobile technology standards can be researched and deliberated for several years before they are adopted.
- Qualcomm noted that there is much misunderstanding about what is occurring in standards bodies. For example, a large number of contributions are coming from “a certain country”, but these are not always necessarily highly organized. Stakeholders should therefore understand how to better approach this situation comprehensively, as both companies and government.
- Ericsson argued that standards are essential and that technologies cannot scale globally without standard-setting organizations. In terms of issues with implementing 5G in connection with the standard-setting process, it suggested that the government ensure that voting and contribution processes in standards organizations are fair and that the United States look for ways to foster greater participation in the process. In terms of U.S. involvement, Ericsson suggested that the United States could leverage an organization like ATIS.
- Nokia highlighted the importance of establishing Open RAN as the global 5G standard. When technologies have been based on global standards, there has been widespread adoption because vendors are not required to engage in bilateral agreements.
- Access Partnership argued that the U.S. Government should consider policy options to increase participation in standard-setting bodies but that it should do so carefully. For example, the R&D tax credit could be expanded to cover work occurring as part of involvement in standard-setting bodies. However, there is a risk that some countries might view these sorts of policy steps as politicizing the standard-setting process.
- The Information Technology Industry Council (ITI) noted that it is supportive of standard-setting bodies and cognizant of the importance of standards in the context of the 5G deployment. However, it suggested that the United States should be careful in putting in place legal restrictions on the organizations in which U.S. companies can participate. ITI raised the issues with the original Huawei/ZTE ban that had U.S. companies wary of participating in standard-setting organizations. It asked that the government keep an open line of communication with industry so that any activity the United States takes in developing or supporting standards is supported by evidence from industry.

## Funding

**Summary:** Participants discussed the potential role of government funding for research and development on a number of topics.

### Funding for Research

- Cisco stated that when funding is appropriated for the Public Wireless Supply Chain Innovation Fund (which was authorized as part of the most recent National Defense Authorization Act), NTIA could fund research in this area to help industry understand which threats are real.
- Ericsson stated that the United States should accelerate the rollout of “5G standalone” as well as positioning for 6G. The U.S. Government should provide “incentives across

academia, research and development, and public-private partnerships” with these goals in mind. It should also increase funding for testbeds.

- The Atlantic Council asserted that government grant funding and procurement should be leveraged thoughtfully, so that these can support progression toward 5G, as well as 6G, in a manner that enhances telecommunications infrastructure security.
- Verana Networks highlighted that customers expect vendors to conduct trials of new technology before bringing a product to market, which is difficult for new vendors. Trials are important to demonstrate value, but are expensive. Verana Networks suggested that the government could offer financial support to new entrants for these activities, modeled after NSF efforts. It further suggested that because radio access network (RAN) equipment is a hardware-intensive business, it is unlikely to be available off-the-shelf in the near term. Therefore, the government should support new companies to reach scale in hardware manufacturing.
- Samsung said that government should help the industry ecosystem accelerate the transition to 5G and lower hurdles in two ways: first, supporting interoperability testbeds; and second, conducting pilot programs in some of the government’s own procurements. NTIA specifically could help through the Public Wireless Supply Chain Innovation Fund and in partnership with the “5G Challenge,” organized by the Department of Defense and NTIA.
- Mavenir advocated for more government support for U.S.-based companies in the form of grants and tax incentives, as the United States is lagging behind other countries. If U.S.-headquartered companies are to flourish, action must be taken now. American suppliers already produce the key components of the disaggregated network, but there is a need to identify the right incentives to pull the industry together.
- Global Foundries argued that whichever incentives are created, they should take the entire supply chain ecosystem (e.g., software, hardware, packaging, modules) into consideration. By incentivizing the whole range of supply chain participants, the government could help accelerate the “onshoring” process.
- Rakuten sees a role for government in 5G implementation/adoption by providing funding for reference designs for radio units in addition to financial incentives for an Open RAN secure supply chain.
- VMWare is supportive of funding the measures outlined in the USA Telecommunications Act in full.

## Infrastructure

- The Fiber Broadband Association pointed out that 5G depends on ubiquitous fiber deployment. It urged government broadband subsidies to prioritize fiber because it will provide a secure backbone for 5G, maximize performance, and reduce the demand for spectrum. It also highlighted that virtually all developed nations are moving forward with fiber investments and treating it as a strategic asset. Therefore, the U.S. Government should invest in research and development for next generation technology.
- Mavenir stressed the need for more governmental support for U.S.-based companies in the form of loan guarantees, grants, tax incentives, and demonstration sites.
- DISH Network noted that Congress should fully fund the Public Wireless Supply Chain Innovation Fund. Dish would expect the program to receive numerous grant proposals



from smaller companies, and funding support would allow these smaller companies to scale up by hiring additional software engineers and building manufacturing facilities in the United States.

## Workforce

- Intel described 5G as a “game changer” at higher societal and economic levels. The development of 5G is within the “wheelhouse” of U.S. companies and technology firms, but there are some important issues to consider if the goal is to compete effectively in 5G and move into 6G. These include workforce development, STEM education, diversity, and an immigration system that allows for people with critical skills to immigrate and fill roles.
- The Fiber Broadband Association suggested that the U.S. Government should enhance workforce training and education.
- Xilinx touched on potential future issues with university talent and the research pipeline in telecommunications work. It discussed how foreign universities, in Germany for example, are taking the lead in this area. This is a critical issue as policymakers look beyond 5G to 6G.

## International Competitiveness

- Samsung made three distinct suggestions. First, the EXIM Bank should have more flexibility and agility to support global trusted telecommunications deployments. Second, the Development Finance Corporation (DFC) needs more flexibility from Congress so that it can support 5G-related deals. Samsung urged policymakers to consider the European Energy Security and Diversification Act as a model. Third, Congress should sufficiently fund the Multilateral Telecommunications Security Fund. Samsung stressed that a heavy-handed regulatory apparatus would be stifling for 5G growth, so the United States should lead instead through market incentives and the aforementioned policy tools.
- Nokia stated that the United States should expand export credit financing. It applauded the financing developments by EXIM in December 2020, but indicated that most of that financing would be unavailable to microelectronics manufacturers due to how EXIM counts content being out of step with the rest of the world (i.e., ignoring aspects like U.S.-based research and development, how sub-content is shipped). Secondly, Nokia flagged that the Organisation for Economic Co-operation and Development guidance addresses the rates that EXIM can lend at relative to market rates. It asserted that Chinese banks’ rates should also be a part of the calculus so that U.S. rates can be competitive.
- ITI reiterated the importance of multilateral telecommunications security funding, as well as easing relevant DFC funding constraints and the need for further flexibility from EXIM.
- The Atlantic Council noted that while the U.S. Government has resisted deep participation in telecommunications-related commercial deals, other governments have participated directly. To compete with Huawei, NTIA or another government agency will need to engage with industry and international partners on another solution, which will likely be made up of more than one company. Considering how an “adversary” is

deploying this network, the Atlantic Council noted, policymakers must understand the “right way” to deploy 5G, not just a low latency network.

## Open Radio Access Networks (Open RAN)

**Summary:** Stakeholders were generally supportive of Open RAN with some reservations, but had divergent views on whether the government should mandate its use.

### Support

- Rakuten described its development of the only cloud-native, open architecture-based solution that has both open core, open access, and Open RAN and virtual RAN. It argued that industry needs the support of government, as with any new technology. Government can use incentives to encourage and drive others toward this new architecture. Specifically, government can use its own 5G experimentation initiatives to ensure Open RAN is being considered and incentivized.
- Qualcomm emphasized that Open RAN activities are important to expanding the ecosystem and potentially enhancing security. It also noted that Open RAN is a different concept than open source code. While open source code is one method of implementation, it is not the only one. Open RAN is built to support virtualization and open-source projects, but can be implemented without either technology.
- Mavenir highlighted the lack of domestic demand for Open RAN. It noted that major EU operators have said that they would support Open RAN, but there has been no activity with the top three operators in the United States. It stated that U.S. operators need encouragement to deploy certain portions of their networks using new approaches such as Open RAN. It further argued that it is unfair to expect smaller U.S. operators to adopt Open RAN when bigger ones may not be doing so, and that government should encourage large operators to get involved. Finally, Mavenir stated that taking action this year is important because operators may be locked in to the vendor choices they make now for years to come.
- Palo Alto Networks asserted there must be a focus on cybersecurity as part of the development of Open RAN, including permitting cloud security and implementing a zero-trust approach to vendors.
- The Telecom Infra Project stated its expectation that Open RAN architectures will lead to a higher speed of innovation, improved network economics, and a sustainable supply chain. However, policymakers need to look at the business case, including large upfront capital expenditures that may not always be offset by the use cases. It will be important to find a way to lower these costs.
- VMware does not view Open RAN technology as needing to be tested, as VMware is already working with DISH to implement virtualization as part of its 5G rollout. Other countries, such as Germany, are taking significant steps on virtualization as part of 5G deployment.

### Mandates

- Dell Technologies spoke about having government policy promote a secure, Open RAN-related ecosystem, including accelerating this shift by mandating Open RAN solutions in federal solicitations and contracts.
- Mavenir focused partially on the idea that Open RAN is both secure and supports security, such that it does not see why more “edge openness” would be harmful. Mavenir would also be interested in mandating that incumbents become more open, similar to the measures taken with Microsoft in the 1990s.
- Nokia argued that the government can help create testing environments similar to existing networks, showcasing that it is possible to combine equipment from multiple vendors while retaining both a high level of performance and security within the network. This could address industry concerns around open architectures without relying on mandates. It also argued that the government should be reticent to establish geography-based preferences in terms of vendors because of the risk that such preferences would push other countries to adopt their own “indigenous innovation” agendas and risk U.S. credibility on this topic.
- AT&T noted that it and other large U.S. operators are part of the Open RAN Policy Coalition and are supportive of the effort. It distinguished the efforts in Europe from those in the United States, because whereas European operators are looking to replace Huawei equipment in their networks, U.S. operators have not sourced from Huawei in the same way. The challenge for U.S. operators is instead trying to integrate new approaches and equipment with existing networks. However, it is just a matter of time before Open RAN is incorporated into existing networks, and it would be inappropriate to mandate a solution.
- Verana Networks spoke from the perspective of new entrants and startups, and urged the United States to push for Open RAN interfaces in radio access networks domestically and worldwide. It argued that doing so would level the playing field for new entrants and reduce risks for potential investors, who otherwise may worry about companies not being able to get products in to the market because of the incumbent proprietary interfaces.
- Verizon stated that the move to Open RAN is a “journey” best managed through industry leadership in standards development. It supports efforts, such as the Public Wireless Supply Chain Innovation Fund, to help with R&D and trials to build up Open RAN capabilities and support new entrants. However, it does not support any rules that would require operators to deploy Open RAN, as the benefits of Open RAN are evidence enough for operators to move in that direction.

## International Cooperation

**Summary:** Stakeholders stressed the importance of international cooperation with likeminded partners.

- ITI encouraged the U.S. Government to continue advocacy on these issues bilaterally and multilaterally, including through the Digital Connectivity and Cybersecurity Partnership. Also, the United States should continue to expand funding for 5G and cybersecurity-related business development trade missions and reverse trade missions.

- The Communications Research Center, a component of the Canadian government, expressed a desire to follow up with NTIA to discuss efforts to collaborate and share information relating to 5G implementation and deployment.
- Access Partnership brought up the multilateral fund that was authorized as part of the USA Telecommunications Act and asked if the U.S. Government would consider cooperating with partner governments to secure their participation in a true multilateral fund. It suggested that the State Department could begin discussions of multi-state participation as part of the G7 process.
- The Open RAN Policy Coalition described its engagement on educating stakeholders (including governments) about the benefits of 5G and Open RAN, coordinating on R&D and sharing best practices among partner governments, and encouraging governments to take action (particularly fiscal action) towards accelerating the deployment of 5G. It expressed support for the United States working with the United Kingdom at the G7. The Open RAN Policy Coalition also noted the importance of multilateral work in advancing Open RAN and the deployment of 5G worldwide.

### Additional insights

**Summary:** Participants also covered a number of other issues pertinent to the success of developing secure, robust 5G networks, including the issues of spectrum, security, and semiconductors.

### Spectrum

- AT&T stated that the United States is not “behind” China on 5G, but it does need to implement additional policies in areas such as mid-band spectrum.
- Mavenir noted that there are opportunities for developing countries to design and manufacture radios used as part of 5G deployments. Per the ITU’s spectrum policy, a number of countries use different spectrum allocations for 5G, so there is opportunity for developing countries to become involved in the design and development of radios that use different frequencies. The limiting factor with this sort of involvement is access to affordable silicon/microchips.

### Security

- Cisco said it has heard concerns that openness may have a negative impact on security and that this would be an area where additional research would be useful. There will be new “seams” where equipment comes together, and there are claims that this will increase security risks. Cisco noted, however, that industry is now far enough along to be able to say that the benefits of openness will outweigh risks. Open RAN will address concerns about vendor diversity as it disaggregates the technology stack, allowing hardware and software services to be teased apart.
- Microsoft argued for security to be built into standards and for the government to partner with the private sector to ensure that all are looking at this issue properly.

- CCA noted that smaller carriers are more likely than larger carriers to depend on third-party vendors, which could leave them more vulnerable. These carriers need more tools to conduct diligent security analysis. CCA members are considering Open RAN and virtualization. However, they are concerned about future security issues arising from integrating the equipment. CCA stated that government could potentially play a role in mitigating these security concerns, but that it should let the new ecosystem develop without mandates.
- The Fiber Broadband Association said that security of the supply chain is critical to national security. It argued that the government should protect the U.S. industrial base, consider clear criteria for trusted suppliers, and address harmful practices by other governments. For example, China's excess capacity in fiber is being dumped into the Indian and European markets, driving down global pricing, revenue, and ultimately research and development capacity. The U.S. Government should work with allies to address the issue of unfair subsidies, which are the root cause of such excess capacity.
- Mavenir noted that the radio supply chain was originally located in the United States but that it and much of the relevant expertise has moved to Asia (predominately China and Taiwan). The efforts of Mavenir and Facebook/Evenstar in creating RANs are positive steps, but the general lack of U.S.-based radio R&D is a "red flag" for supply chain security.

## Semiconductors

- Dell Technologies spoke about its concern with the absence of large portions of the U.S. technology ecosystem within the wider 5G ecosystem. Currently, there are no scale providers of U.S. origin. While the United States has a semiconductor ecosystem and network operators, system development, delivery, and innovation have been lacking over the last 10 years. 5G is no longer just a telecommunications industry concern, as there is overlap with information technology, cloud, and other ecosystems. The current limitations create vulnerabilities and slow innovation, and U.S. policy should encourage closing this gap by pulling the broader technology ecosystem more fully into the 5G ecosystem.
- Intel mentioned that it is the last remaining semiconductor manufacturer in the United States. It argued that the Creating Helpful Incentives to Produce Semiconductors for America (CHIPS) Act is critical for supply chain security and regaining technology leadership so that the United States can compete now and going forward, given 5G's broad importance across the economy.
- Ericsson noted the importance of both a U.S.-based 5G manufacturing and silicon/microchip design capability. In regard to the microprocessors, it noted the importance of customized chips to get the maximum capability out of limited spectrum allocations.

## Conclusion

Several themes and suggested policy measures emerged during the listening sessions. Participants expressed appreciation for the ability to engage directly with the U.S. Government

through the sessions and encouraged ongoing and open lines of communication. In particular, participants raised the need for improved information sharing on security matters between the government and industry, and within the government. Removing barriers, such as potential liability, is important to ensuring the sharing of information between the private sector and the U.S. Government. The U.S. Government's having a well-articulated plan and speaking with one clear and consistent voice were also described as key.

Funding was another significant part of the conversation. The focus was primarily on the potential role of government testbeds, but participants also cited the need for the U.S. Government to invest in infrastructural measures like fiber network build-out, in workforce development, and in international competitiveness.

Participants argued for continued U.S. Government support for voluntary, industry-led standards development processes, stressing the importance of these standards for the global security and interoperability of 5G networks. Participants also covered a number of other issues pertinent to the success of developing secure, robust 5G networks, including ensuring there are adequate spectrum resources, the vital role of semiconductors in developing 5G, and the need to secure the semiconductor supply chain.

Participants were generally enthusiastic about Open RAN's potential to deliver a range of benefits, including greater vendor diversity and supply chain resilience. They also supported an active role for the U.S. Government in fostering the conditions for Open RAN's continued development and adoption and in sending clear signals of support to the marketplace. Though not all participants shared precisely the same viewpoints or suggestions, prominent recommendations included:

- Providing governmental assistance for relevant research, development, trials, and testing activities, such as through grant mechanisms like the Public Wireless Supply Chain Innovation Fund;
- Building support among foreign governments and enhancing international cooperation on open and interoperable architectures;
- Leveraging a wide range of governmental tools and initiatives to advance Open RAN, including procurement, tax and other incentives, additional grants, and pilot or experimental programs (e.g., the "5G Challenge," organized by the Department of Defense and NTIA);
- Emphasizing the need for strong cybersecurity postures in Open RAN solutions;
- Considering appropriate ways to help improve the business case for Open RAN and "de-risk" potential venture capital investments; and
- Encouraging U.S. operators to consider deploying Open RAN in parts of their network, though participants did not fully agree on how directly the U.S. Government should press for this outcome. Many participants noted their opposition to the imposition of strict mandates to use Open RAN.

Many of the recommendations above are already reflected in the National Strategy to Secure 5G Implementation Plan, and all will be taken into consideration as the U.S. Government executes the Plan and continues to engage on issues of 5G development and deployment.



## Appendix A: Transcripts

These transcripts were autogenerated from the video recordings of the two industry listening sessions.

### **5G Industry Listening Session: Market Incentives Transcript - January 28, 2021**

Acting Assistant Secretary Evelyn Romale for opening remarks. Just one quick housekeeping note. Please note that this is going to be recorded for internal note taking purposes only and please make sure a particulare Lee. If you are dialing in to keep yourselves on mute. Thank you very much and I will go ahead and take it away. Thank you Thomas. When I went to Molly, I'm currently serving as Acting Assistant Secretary for the National Telecommunications and Information Administrative Sanction. Let me welcome you to the first of two industry delivering this answer. Focus on the recently released national strategy to secure 5G implementation plan and fiance advocates for his blood library digital economy worldwide that enables all citizens to benefit from the promise of the Internet and connectivity. Communications infrastructure is important lifeline which will take about two clearly over the long run, spent endemic and we riot transformation alone within this market. Advancements in wireless communications that we are beginning to get done with this provider. Comma step further enriched by Boston Cancer National Security, and to bolster our army an industrial piercing. It promises is inspiring, necessary global economic potential. Instagram Gray in the United States alone, IGA is predicted to add up to 3,000,000 new jobs and create 500 billion economic growth. But we must act and acting other other government industry can ologist infrastructure for nonprofits to realize this promise. Anything working with the Federal Communications Commission? Make sure the other stations. Carriers to build robust network work and meet the demand for advanced answers. But we also know that the problem is the 5G is not more than just building from. That works extremely important to ensure that these services can be safely and securely accessed by American consumers and industry. Installation is focused on marketing initiatives and we're going to keep the type types. What we hear from as many of them as possible, and they did a critical time to provide input to the executive branch team that will drive the Secure 5G Act requirements for work. Work today will focus on three areas closing. Ensuring domestic industrial base liability and leveraging trusted domestic and international partners acquires the discussion. Today will be analyzed in turn turn the proceedings report to Health Administration further develop its policy to the security Department. Unemployment I've changed. Two partners in doing this here today from my friends are here to listen. This is you are such that we want to understand like Misty as the most important market incentives that government and industry trends in about expense. You will need a few of the key individuals. Today we're driving secure 5G. Finally, but I was over to Travis, how will come see you today to then? I want to say thank you to everyone who helped pull today's event together. Travel towel Africa since KPMG. You said that you would use cocoa stuff. Kill Brian Lane and numerous interagency and industry partners. And with that I will turn it back over to grab this for some housekeeping. Thank you. Alright, thank you very much. Evelyn Ann. Apologies for some of the audio quality issues. We certainly have an. Evelyn, do you mind muting for just just a second? I do that the housekeeping right. Great, perfect, OK so housekeeping quick First off I will be calling on folks after we were going to have somebody from my guy introduced the three topics each of the three topics and then someone from our government partners will be giving a little bit of flavor for some of the



activities of the federal government are doing. And then we will be opening it up to cook to discussion. I have already identified a few industry stakeholders. To help lead off the conversation and make things a little bit more logistically smooth in terms of transitioning from Government stakeholders to industry stakeholders and then we will be turning into a little bit more of an open mic, allowing for folks to to chime in in order to time in. Please raise your hand. The teams function allows you to raise your hand and put it in the chat that you would like to speak, including your name and your organization. If you are dialing in, please send an email to me. T Hall tha LL at ntia.gov ANTHALL. AT&T DOT giovi with your phone number so we can identify you and your name and organization on the session again is public. It is being recorded for internal work note taking purposes and if you are unable to comment today we are very short on time. So I'm trying to speak quickly. It's OK. My email address againthall@ntia.gov email me your comments. We will make sure they're taking into consideration. We've got a lot for the next two hours. I'm very excited and with that we will turn it back to Evelyn to open up the security session. I think she's going to keep her audio. Her video off and hopefully will have a little bit less feedback on how. Thank you everyone feedback so thank you everyone. Thanks Travis. So in this session we will the first session we will focus on incentives for addressing security gaps in 5G architecture, looking both at risks at the technical level with deployments as well as broader national resiliency risks related to 5G supply chains. We know that there's already much work underway in this area, including the DHS supply Chain Task Force. And the ecosystem wide work implementing the botnet road map. NTIA is also partnering with Industry an international partners to look at ways to bolster vendor diversity and secure integration of open architecture systems. As an additional example of our work at NTIA, we've been working with industry players on adding transparency to our software supply chain through the development of a software software bill of Materials or espam, an S bomb will help those who right. Purchase or operate software to understand potential risks in the software supply chain. When a new vulnerability or risk is discovered and espam can help any organization realize whether they or their customers might be at risk. In addition, last summer NTIA established that communications supply chain Risk information partnership. This is a program that is targeted towards small and rural equipment suppliers and providers of communication services. We want to improve these companies. Access to information about risks to key elements in their supply chain. We must work together domestically and internationally to ensure that open, transparent standards are at the foundation of our networks. It is only through cooperation with industry and our international partners that we can accelerate the global transition. Tordon open 5G network architecture and build a diverse 5G ecosystem for this first topic, we will be focusing on gathering concrete ideas on how. The government can foster through this ecosystem secure 5G infrastructure light chains. So before we hear from you and the impressive list of lead respondents who have volunteered with us to seed the discussion today, I'm going to turn it over to Justin Falb from the FCC. Justin is going to touch briefly on the work they are undertaking to address security gaps in our communications ecosystem, and then we'll turn it back to the industry members to the begin the discussion, Justin. Thanks Evelyn, and thank you all for having me. I'm just installed. I'm a legal advisor to the Chief of the Wireline Competition Bureau. I also manage our supply chain proceeding over at the Commission, and I know time is tight, so I'll go pretty quick since I suspect a number of viewers somewhat familiar with what we're doing, especially since we were just appropriated \$1.9 billion. So that tends to get people's attention back. In 2019, the FCC adopted a rule prohibiting the use of any Universal Service Fund support for a company. Order from the services that poses a threat to the communication supply chain or communication

networks. In that item. We had initially proposed that Wall Way in ZT, E were such entities, and in June 30th of 2022. Excuse me 2020, our public safety and Homeland Security Bill affirmed those designations and released orders designating Willway NZT as those threats. Therefore, as of June 30th, 2020, no federal support from the Universal Service Fund could be used to support any equipment or services from waway or ziti. At the same time that that proceeding was going on, Congress passed the secure and trusted Communications Networks Act, which set forth a couple obligations, one of which was the C script program that Evelyn mentioned for the SEC. Specifically, we have to publish under Section 2 a list of equipment and services that pose a threat to national security. Those equipment services will be identified through floor enumerated sources under Section 4 of that act, we have to establish the secure and trusted communications networks reimbursement program. And. That is the program that will be operating to reimburse entities for removing, replacing, and disposing of insecurity equipment. And in December of 2020, we released the second report and order that adopted rules for those programs. So we're now getting up to speed when we adopted that item in December, Congress had not yet appropriated the money, so we made contingent a few portions of the reimbursement program until we knew what the appropriations would be receiving in the Consolidated Appropriations Act. Congress did appropriate \$1.9 billion for the Secure interest Communications Networks Act implementation. However, Congress did add some language in the Consolidated Appropriations Act. That require that updated their networks act, so we have now released a proposed draft that will be voted in our February 2021 open meeting to modify our rules consistent with the language in the Consolidated Appropriations Act. So we would definitely ask that everybody. Check that out and see if you have any information that you would like to comment on that. The only thing I'd like to add that will be forthcoming that we would love some feedback from you on is we have this part of the rules and the Secure Networks Act. An obligation to release a list of suggested replacements for equipment that needs to be equipment. Services that need to be replaced. We're also going to be releasing a catalog of eligible expenses that will help inform the replacement process. We're going to be seeking comment on draft versions of both of those, so please keep an eye out for that so that we can make sure that the reports that we will ultimately be adopting will be as thorough and Folsom as possible. And with that I'll pass it back to Evelyn and let's make sure we can hear from all our important stakeholders. Thank you. Great, I will go ahead and take that back and we'll go ahead and get started with our with our first industry stakeholder and Catherine. If you could just go ahead and open, I think we've got Chris Boyer from 18 T lined up, so Chris could I think that you're set and you're ready to go? If you could, I'm yours. Yeah great. However, can you hear me OK? Can hear you great no static OK yeah, so Chris Boyer from 18 T and usually what I'd like to talk about with 5G security is that there's a lot of issues that are brought up in the context of 5G that I think are that are conflated as security issues. And So what I'm going to do a little bit unpack what I think are some of the key issues. So I think there's about. There's probably 4 buckets of topics that generally are raised as security matters, so the first one is kind of true. Will call traditional security issues around the security of the network, right? So this is, you know, is the 5G architecture. The network itself you know. What are the security measures being built into the network, and I know some of the other speakers here on the panel today are greater experts in that than me, but the bottom line is that the industry is taking a lot of steps to secure the 5G network. You know, I would argue that 5G will be the most secure network network architecture we've deployed to date because of some of the new capabilities that are going to be implemented with 5G, such as encryption of the NZ Mobile Edge computing where we're shifting some of that technology closer to. To the edge

where we can apply security controls on the network closer to the user and prevent certain types of attacks. So there's a range of things happening with 5G from a network architecture perspective that we think will improve security. That's not to say it's going to be perfect, and that there will be things that need to be done to architect the network in a way that is secure, and there's always going to be issues as we all know with cyber security. But I think we should be encouraged that the industry is really recognizing this as a really key aspect of five G, and if you look at what's happening in like at three GPP an essay 3, which is their security working group. The work that's going on at the FCC and this is Rick with various working groups on security. There's a lot of work being done on the industry side to beef up security, so that's kind of my first point on kind of network security. Second category of issues is this issue around the supply chain, right? So if we consider the long term viability of our supply chain as a national security matter, then you have this other category of issues around, you know is the is the supply chain sustainable in the long run you know? Is there enough diverse set of vendors? That are delivering technology so that we can lead in innovation and R&D and stay out in front. And I think on that issue. You know we have been a little concerned that there's been, you know, as we all know there's been a contraction in the industry. There are largely especially in the radio access in that portion of the network. There's only a few vendors and they are partners of ours and we work well with both Ericsson and Nokia's are as our 5G vendors. So I'm not saying it's a criticism of any of our existing suppliers, but there is a concern about, you know, do we have enough? Is a supply chain diverse enough and sustainable for the long haul? And then you bash that up against what you know. Some would argue our tactics coming from other nation states that I won't name, but we all know who they are that may not be playing fair on on these issues, and so what's the long term trajectory that we're on? And how do we make a more sustainable supply chain? And? And that's one of the reasons why I think you've seen 18 T and a lot of other companies supporting the concept of open ran as a way to bring more diversity and and more suppliers into the into the ecosystem. And it's going to take time. It's not going to happen right away, especially for big large players like in 18. T have you embedded in infrastructure investment? But I think open ran another technologies to expand the supply chain is a second category of issues. Third one is on the standards front. We hear a lot about how the standards are hopelessly flawed because certain countries are flooding the zone with a lot of contributions. Are Gen perspective. There has been that thus far with three GPP, which is the 5G standards body. You know, we've gotten good outcomes with release 15. Release 16 etc. But the concern that we have is is more around the long term trajectory that we're on. Is that sustainable? And I do think there is a role for government to play kinda convenient role. We don't want government takeover standards, it needs to be fundamentally private sector LED. But there is an element of government could get to wrap up final 30 seconds. Yeah, so I think government plan to control standards. The last point the 4th category is the overall kind of race to 5G and whether we're ahead or behind. I won't go into details there. All I can say is that. We don't think we're behind China on 5G. You can cherry pick statistics if you want too and kind of make an argument either way on that issue. But I think our view is that the US is still in the lead, but we do need to implement policies around things like mid band spectrum and other things that will that will keep us there. So with that. Thank you so much Alexi from CCA. If you could go ahead and unmute yourself, yeah, thank you, Travis, and thank you everyone for hosting this important conversation. I'm here on behalf of CCA. We represent mobile wireless carriers of all sizes, including small and rural and regional carriers that are in varying stages of transitioning to 5G. But we're all focused on the path of 5G. And our perspective on this topic is honestly inform, partly by the fact that some of

our carriers have been dealing with the Chinese equipment issues and the rip and replace process for the last few years. Probably the single issuer members raised the most is the need for clear, ongoing dialogue with the government about security threats. I mean with respect to the Chinese equipment. For example, we in our Members asked for years about the specific nature of the security threat. Is the threat at the core of the network, the Radio access network backhaul? What do we do about the fact that non Chinese equipment may have Chinese components and you know our carrier members are patriotic citizens trying to serve their local communities and essentially asking the government tell us what the threat is and tell us what to do and they felt like it took years to get clear direction so that slow pace felt like it created real paralysis for some of the carriers without clear direction, kind of unable to invest in their networks with confidence. They asked for a list of approved vendors. So if they make a change they won't find themselves in the same position a few years down the road. And we're still waiting for that. So I think one key point is that we just can't afford to repeat that timeframe going forward when you need that clear dialogue going forward, we're really pleased to see NTIA launch to see script program, but we're concerned that if there's a lack of clear and timely direction on national security threats, it really is an impairment to deploying broadband in rural America. Second point, just to emphasize, is that small and regional carriers are more likely to be relying on 3rd party vendors for a variety of functions that large companies may be handling on their own. So small carriers might be buying a software license rather than developing their own proprietary software. They may be relying on vendors not only for equipment, but also for ongoing service and support. And if a vendor is offering a product or service, the small carriers typically are not in a position to do their own. Independent deep dive assessment into security. They're really focused on whether it works are members, often tried, it conducts due diligence on a new vendor. They haven't worked with before, but they need the tools to conduct that diligence from a security perspective, and they don't have those tools right now. So I think government can help provide tools that will facilitate the ability to evaluate vendors from a security perspective, but that also means that communication about security threats really needs to reach across the entire ecosystem, including vendors. And ideally I security would be baked in at the standard setting level. So I agree, standard setting is driven by private parties, but the government can play a role in ensuring that security is baked in from the start. And finally I mean a number of our members are evaluating new, open, ran and virtualized network options. We think that the emergence of open ran and virtualized network shows promise and is worthy of continued evaluation and research. Having unique network deployments with multiple vendors integrating may raise some novel security issues. You know? Government can help. Make sure again that security is part of over and standards as they are created and in fact it government in its role as a contractor can insist on a level of security that will help drive an industry standard for 5G going forward. But the emergence of these new open ran deployments, we think, counsels in favor of letting that ecosystem develop organically without trying to force a technological mandate. We want this ecosystem to develop in a way that it can ensure that unique deployments and configurations of networks are secure throughout. Including both hardware and software, and at the points when different vendors are interacting with one another. So that's I think our key points from the CCA perspective and from some of the small and rural mobile carriers want to really commend NTIA for holding this session and thank you for allowing us to participate, and I'll take it back to Travis. Thank you so. Thank you so much I could get at NCTA up. Well, don't beat yourself. At Amber thank you, Travis. This is Tampere with ntsa, the role Broadband Association, Travis and everyone else at NTIA. I want to thank you very much for organizing this listening session as

well As for inviting me to participate. This coordination that you have established through this listening session and through your request for comments in the preceding that perhaps led up to this listening session is a critical example of one of the three keys in my vision that are necessary to allow the industry to continue to move forward to advance to 5G. And keep up the same consistent reliability that we've had throughout this pandemic and throughout generations of service. So to begin with, the coordination would be the first thing, and again, this is a perfect example of where coordination comes in. Coordination between the Communications industry, coordination between government officials, all working together to identify what the needs are, what the concerns are so that we can keep the systems up and running and their day in and day out regardless of pandemic, regardless of. Everyday conditions, whatever those may happen to look like when we returned to them. The second piece that I would say is necessary is awareness as mentioned for CCA. I echo the same sentiments that providers absolutely need to know in advance as much as possible what concerns are there in the government that certainly equipment facilities services may pose a threat to national security? But Needless to say, detrimental to their operations to be in a situation similar to what has occurred now, where they perhaps in good faith installed, purchased equipment to only find out later that it is a threat to national security, and they're just as concerned as everybody else about protecting national security. But what steps can we take going forward to identify those equipment early? I anan hopefully before they end up in somebody's network. And that ties into my last point, which is information sharing and that information sharing needs to go two ways between government as well as industry, industry, government so that industry can bring to government any concerns that they may have about equipment that just seems off or software that just seems off an intern. Government can reach back to the industry early on to say with inasmuch possibility. What kind of equipment? What kind of concerns are there? What have you seen? And as many of you likely know, that's already on going through the Information, communications task, or scrim working group specifically on that issue that has undertaken it for a period of time and will continue to do so this year. I would just encourage industry and government to participate actively with that working group to make it as influential an helpful to both sides as possible. So thanks again, I look forward to working with you going forward. Great, thank you so much if I can now turn the microphone over to Edna from Microsoft. Great thank you for having me. It's Microsoft privilege to be here. I'm not going to put video on on the spirit of trying to keep the audio intact. Travis, is it acceptable level of audio? OK, you're giving me a thumbs up excellent, thank you. So I think you're going to hear some common themes from those of us on the private sector side. A couple of things to think about. One that I will always note as the Co chair of the Information Sharing Workgroup in that supply chain risk management Task force that timber just referenced is precisely that information sharing. But most importantly we need some legislation from the government. To protect the private sector from the types of suits that could prevent the valuable information sharing between ourselves, public to private, private to public, and private to private, and that is going to be something that we certainly going to continue to work on meaningfully. Evelyn is heard me talk about that for some time. I think Espam actually helps us a little bit with the sharing of that kind of information. We start to see. Who has what? Where the other thing I think I'd highlight is a couple of sub threat vectors that we're working on over in the during security framework and I Co. Chair at the Threats Workgroup and what we've been looking at is 3 main areas, so the first is really policy and standards sub threats. One we need to be present at the forefront of the US. At these standards there is nation state influence on 5G standards were well aware of it. We need to be at the table both with. Private sector participants and, where appropriate, government sector

participants as well, I will reiterate something Chris Boyer referenced, which is an example with open ran as a place where we really can have controls, opportunity expansion, and make things not optional and share information in the form of a meaningful standard. The second sub threat that we've been looking at is, of course, supply chain, and we're looking at the things that you all are aware of. Counterfeit components inherited components. And the full spectrum as well, of we're folks can attack in the five G infrastructure, and that leads to the next area, which is 5G systems, architecture, sub threats. So we're looking at some things where we can actually identify, either through a government agency pushing out if not a standard guidance, but we prefer a standard on software config, network security, network slicing, legacy communication infrastructure, and how to address it. As well as really tackling multi edge computing spectrum sharing and SDN software defined networking, I think there are a number of standards out there. You need to let the private sector continue to grow there, but partner with us in ensuring that we're looking at that through the unique lens of a 5G architectural implementation. That's it for me. Excellent, thank you so much and just take. I will take since you gave me a little bit of extra time. Take the moment to remind folks who are on the phone if you want to join the conversation, please email me THALL at NTI a.gov, THALLNT dot giovi and if you're on teams feel free to raise your hand an note in common in the comments. Your name and organization and that you'd like to participate with that. Let me hand it back to Eric from Cisco. Who very helpfully has his hand raised, you should be able to unmute yourself or Catherine Ari. Why don't we, Eric? We will work on that for you. Why don't we go ahead to Jason from Airways? Don't know. I think I think that works. I was just giving the right to unmute salon. OK, thank you for great. Alright thank you. I want to say thank you first to NTIA for its leadership on developing 5G strategy and implementation plan for the US federal Government an for its ongoing commitment to work with the private sector stakeholders, including this series of forum will focus my remarks. Brief as they may be, an openness and security. There are concerns that have been raised that openness may have a negative impact on security and that this represents an area in our view where focus research would improve our understanding about whether and how open interfaces impact risk and what steps steps would be useful in terms of mitigation, industry is now far enough along in the development of open ran that security researches timely and meaningful, and our belief is that the learnings that will result will significantly improve security as compared to closed architectures. At the outset, it's worth noting that there is some confusion among policy makers, but not really at NTIA about the distinction between open source and open ran. When we speak of open ran were describing a network wireless architecture that by virtue of leveraging open defined standards based and interoperable elements, can be decomposed into modular, swappable components, potentially even from. Table vendors those modular components can be can include closed box or proprietary technologies or open source technologies. Any combination of the two as possible and it's up to the market ultimately to decide what products and services will be the winners in each segment of the network. Realizing this vision of an advanced wireless network will allow sourcing technology from multiple vendors and address concerns that have been raised about diversity of vendors in the in the network marketplace and even the ability will. Present to disaggregate the technology stack to allow for hardware, software and services to be teased apart. We anticipate that this approach should lower barriers to entry. An promote increased competition vendor diversity and innovation. The ability to put these pieces together like Lego Blocks and I know that's kind of an imperfect analogy because there's only one brand of Lego. But imagine if you had multiple different brands that you could put together into a functioning network stack. Does, however

result in new seems where the blocks come together. And it just changed the threat surface area. Some of the claims about the nature of these threats and the complexity of managing them, maybe real. And some of them may be exaggerated. And this is where we think that the government can help when the authorization for R&D funding included in this past year's National Defense Authorization Act is appropriated, and we hope that that happens very quickly, NTIA could usefully fund research to help industry better understand what the threat. What threats are real and how best to mitigate them, how best to mitigate them, and what claims of threats are exaggerated and should not impede the speedy rollout of open and modular 5G networks. Open ran odds adds auditable security through modularity and open interfaces. The research that I'm calling for today will help focus attention on the techniques that will most benefit from those capabilities. Taken together, we believe that these factors offer the prospect of increased visibility and control in a well designed open 5G network architecture that should significantly deliver Security benefits over prior generations of mobile networks that relied on purely closed architectures. Thank you. Great, thank you so much Eric. And if we can turn it to Jason from Paris. Thanks very much, Travis, and thanks for inviting Erickson today to to hear some of our thoughts on this. Supply Chain integrity ICT resilience communications security. Those have all been top of mind matters for both US government and for our industry for a long time, so I'm going to focus on those three things today in the topic of supply chain integrity. We should continue to pursue a risk based approach to a trusted supply chain. There's a few examples of this such as the prog proposals, which emphasized that 5G networks should be based on free and fair competition, transparency and the rule of law. There's also multiple work products from the DHS ICT supply chain Risk Management Taskforce. You've heard that mentioned several times today that's been developed from two years of collaboration between government. It in com sectors, a lot of best practices in those work product such as information sharing, identifying supply chain threats across products and services that qualify. Bittering, manufacturer list, best practices and vendor templates for scrim which aligns with NIST 801 sixty one and takes input from numerous. Other industry standards is important to give thoughtful consideration of this type of existing collaborative work. As we advance towards new policy, Zan potential new legislation to protect the integrity and security of our nation's supply chain. On the topic of ICT resilience, 5G certainly brings numerous advances here, not just in technology, but its architecture and deployment capabilities. Ultra reliable, low latency communication, virtualized and distributed functions in a service based architecture allows us to achieve a high level of network resiliency and introduced new use cases at the same time. This enhanced resilience also provides defense in depth from different kinds of attacks on confidentiality, integrity, availability and privacy. And Lastly, network slicing across both the core and the RAN allows for resource in data isolation and assurance, which further enhances security, but also mitigates the effects of denial of service attacks. So these kinds of advancements are all important but consistent implementation of those capabilities is key to a truly resilient and secure network. We look at specifications that have been set forth by three GPP, Etsy, and other standards groups, as well as assurance schema and guidelines from NIST GSM. Any says common criteria CMC. The list goes on and on. We end up with a rather complicated matrix framework in complexity is often said to be the enemy of security. We need a harmonization in alignment with what industry is doing in the multiple silos of requirements across government. A unified 5G supply chain and security policy in coordination with the National Cyber Director will help advance these goals. Lastly, on the topic of communication security, you know when I saw this topic and I saw it to fight closing 5G security gaps. There

were two things that came to mind. One as Chris mentioned earlier, 5G is we think the most secure implementation of wireless technology that we've ever had a two. If you have that on the extreme in a positive way, it means that you're potentially creating a gap during the process of transitioning from previous networks, including those that may be built an untrusted products. Now in the current. FCC says Rick 7 working Group Two, which I was a part of, along with several of you that examined how to best secure the transition of 4G to 5G and non standalone 5G and working Group 3 is currently working on a standalone 5G now. Essentially those are the two bookends that I just described, so that's a good. Another good example of of existing work and how important collaboration partnership and information sharing our between government and industry. US really needs to be accelerating the rollout of 5G stand alone and it should really already be positioning for 6G and developing a strategic vision which the industry can help drive across standards. Now the government can help in this area with incentives across academia, R&D and public private partnership with these specific goals in mind. Another thing that we can do is to help validate these advancements and continue to push. Innovation is greater funding for R&D and that concerted effort across test beds. So there's numerous five you test beds already, which the government is or could be engaged in, such as the next in CCOE testbed. Meters Open G Initiative project and the five G Security Industry Testbed which is cooperation with Mitre, CTIA, Ericsson, Nokia, ATT, T-Mobile, University of Maryland and Virginia Tech. I know that's a long list, but. I'm looking at you could wrap it up. Yep, and those type of efforts it's really important for the government to to be engaged that we're all kind of on the same path there. By working together, we can continue to ensure that supply chain integrity, ICT resilience and communication security for US communications networks continue to be top of mind going forward. Thank you. Thank you so much and also I have again if you want to where we're kind of we're at Max at this point in time for the rest of this session, but if I could have calling from Tia if you could mute yourself and and we'll hear from you and we might have time for one more before we move on to the next topic. Hi everyone, can you hear me well? Good, thanks for those of you who don't know. TJ were both standard setting organization and an Association representing the trusted manufacturers and suppliers of global networks. Just first on behalf of Tia, we really want to thank the staff at NTIA and across many agencies for their impressive effort and pulling together with this implementation plan and as many on the call have already said, including coordination with industry at every step. As the new end administration gets settled, it's critical that this momentum continues. To that end, we particularly look forward to working with NTIA and the administration on aspects of this plan, focusing on utilizing industry expertise to add transparency to existing risks in the ICT supply chain, an identifying incentives and policies aimed at closing these risks. As many have already said, we agree that the government has an important role to play in ICD computer security, but industry has to be the one to drive the solution down. How to add transparency and security to their own supply chains? That's why we've been working on creating a standard since early 2020, focusing on adding transparency to the ICT supply chain that we feel we vital to the administration's line of efforts focusing on mitigating supply chain risks. We started this program back in early 2020 through our subsidiary Quest Forum, which runs the TL 9000 Quality Benchmarking program for the ICT industry. For decades now and we're working on creating an addendum to that program focused on supply chain security. We have 26 member companies working on this across eight groups including technical and non technical factors such as trace, ability of ID and component parts, hardware and software to more non technical factors relating to trustworthiness and we hope to have a version of this complete. Um? Sorry, had a pop up for someone waiting in



the lobby. You have to have a version of this complete internally by the end of the quarter and externally by the end of the year. As we go forward, we think that adding utilizing industry driven standards for mitigating any risks to the ICT supply chain and adding transparency. Your critical role with the administration's efforts on the implementation plan and we welcome to work with you all on this or anyone else on the call going forward, and I'll be brief. And that was all and thank you so much for your great work on this, Travis. Great thank you, let's turn it really quickly to Prakesh from Tonka animals analyst for cash. If you could open your line and will, you will be the last one. And if you could keep it to 3 minutes that would be great. Do we still have you protection? If not alright, why don't we go ahead and locate him or not? I can hear you OK go ahead. OK alright I'll keep it with you brief. I think some of the questions and challenges that have been raised in why? Hopefully get lot of them especially. And I'm a 3GP member. I see the manipulation and you know the. The the impact you know some of the countries trying to bring their by pulling themselves. Although it is a private enterprise, but a lot of times the decision Sandy in voting especially happens on a countrywide basis and you know you can see that people behind the doors are coordinating some of that action. So I think just be in a safe car, put in place to make sure that not one country or some major companies in hijack that process that is 1 and 2nd. When we talk about the infrastructure security as such, I mean in the partnerships it shouldn't be a. It shouldn't be about, you know, just patriotism or the country should be looking at, you know secure partners who who are partners of the country and in in telecom and in other parts of Commerce as well. And then the idea should be building partnerships where you know we have trusted model from. Outside the country, in Word as well, so that the whole ecosystem is much more robust and supply chain is secure and we can trust him and that feedback to you. Travis, thanks for the opportunity. Thank you so much. Alright great, let me turn it now over to Doctor, Shell, Ginkgo from NTS. I TS out in Boulder and she'll go ahead and take it off to introduce our next session. Thank you Travis Travis. How's my audio? Just give me a. OK, great thank you everyone. So I'd like to thank everyone for joining us today. My name is Doctor Cheryl Genco and I am the director of the Institute of Tele Communication Sciences, which is the nation's spectrum and communications lab, and we're in Boulder, Co were within NTIA an we support data driven. Science and engineering are very applied science and engineering for next session. We will be looking at how the US government can help assist the rollout of 5G technologies and the development of a robust 5G commercial ecosystem in the United States, including workforce development. Are robust domestic 5G market is one of the surest routes to securing 5G. We need to ensure that we are working to develop both the use cases and the demand. For five G technologies that will drive us and those implementations in adoptions, there will be market incentives that will allow our companies to thrive and compete. Both home and abroad here in Boulder at ITS we have been building an LTE 5G lab to support and support cooperative research and development with industry. All of you and coordinate with other government labs engaging in the market. As you may know. I TS has a special role in the United States because we are tide to NTIA its very important role for this laboratory. Different than a traditional scientific lab, the Department of Commerce and I TS and the Department of Defense have entered into an agreement to analyze the usefulness of a 5G prize challenge. I believe Catherine's going to put some of the links in our chat. I TS and NTIA has posted this notice of inquiry in the Federal Register to solicit ideas for incentivizing the development of the open 5G stack, perhaps using a prize challenge as a motivator. I would welcome anyone's comments, and also I'll put my personal email in there so that you can reach out to me directly the FY I. The inquiry expires on February 10th today. What we'd like to hear from you. Are the

concrete steps that we can take as a government to ensure a viable, robust market and industry base for 5G? We want to know if industry is facing any barriers to entry that are preventing us from providing services and infrastructure in our recently released Secure 5G implementation plan, we outlined a number of potential activities that could help you as companies compete in this market, including trade missions, funding, R&D activities and promoting US participation and demonstration. And testbed trials I've heard a lot about cooperation with the government in this just today alone. An information sharing one. I hope that my lab can have a central role in this. But the fundamental question we have today is what's holding us back. What should be done to unleash the domestic 5G market? I hope that you reach out and I hear from all of you. Thank you and I look forward to hearing all the thoughts. And I believe that the National Science Foundation is next. Travis, take it from here. Thank you everyone. Yeah great. I let me go ahead and ask if a doctor from Princeton is on and can unmute himself. We're going to give a little bit of time to NSF to talk about their program. Yeah, I'm here. Can you hear me? We can hear you. Thank you. Yeah, thank you. My name is Alex Prince and I am from computer and Information Science Directorate of National Science Foundation. So NSF has a longstanding history in investing in wireless research, and in particular next generation research. So we fund research activities across all different dimensions related to 5G and beyond. We already thinking about 6G and kind of. Knowledge is so in reinvesting. Can efficient use of electromagnetic spectrum but better electronics, better cooperative spectrum sharing increasing spectrum efficiency in closing signal processing, processing technologies, interference cancellations and protocols. Increasing switching from hardware heavy networks and as well as novel users of wireless. So this is done across different directorates across NSF, including. My director at Computer and Information Science and Engineering and engineering directors, as well as recently we also collaborating with mathematical and Physical Science Director at on. On the Spectrum innovation initiative. So some of our recent initiatives, as I mentioned, includes. Different research program that people can propose basic technologies right? And we have invested. Also a special program with engineering course, wireless innovation technologies and recently we launched a Spectrum Innovation initiative which will be in collaboration with NTIA and FCC as well. We also heavily investing in test beds, so our program, which is was a is funded in partnership with industry platform for advanced wireless research we currently have. Three platforms available for experimentation. Powder platform in Utah Cosmos in NYC, and Air Power is coming up in North Carolina. In those platforms, we enable researchers to innovate right and test their new technologies, and they also working with DoD of or in kind of deploying open source implementation of 5G. In particular open air interface. So this is available. To everybody we also working with our international partners in Finland and Israel and France on next generation 6G technologies. Finally, we recently held next G Security Workshop and proceedings and reports will be available. Proceedings already available but report will be coming up in which we investigated all different research topics that are important for next security. Thank you so much again for inviting me and over to back. For you. Great, thank you so much. And so again housekeeping notes if you are on the phone and you would like to participate, please email me THALL at ntia.gov. If you are on teams and wish to participate, please raise your hand. Let us know who you are in the chat and we will do our best to get you included with that let me go ahead and turn it over to John from Dell to get us started. Great thanks Travis. Thanks for having us again. My name is John Rose on the global Chief Technology Officer for Dell Technologies, you know, and I am a aggressive proponent of the US technology ecosystem, participating in in any. Area the concern that we have based on in this discussion is the absence

of significant portions of the US technology ecosystem being present in the five G ecosystem you know. Currently we have no at scale providers of 5G that are US origin. There are fine companies that are non US, but there's no US participation. We have a strong semiconductor ecosystem. We have exceptionally strong operators, but the system development, delivery and innovation is. Significantly lacking over the last 10 years as we saw a dissolution of US Origin Company, specifically Lucent, Motorola, and to some extent Nortel in Canada, where I was the global CTO and head of R&D. That gap for us is the most strategic change that we have to work collectively to fix and the reason for it is not a commentary on the existing network equipment providers. In fact, they're all very good and candidly they provide value, but the absence of the US technology ecosystem, the at scale players. Participating in 5G represents a particularly strategic risk to our broader ecosystem, an industry. The reason for this is that 5G is no longer a telecommunications technology. It has significant overlap with the enterprise use cases, the cloud ecosystem, the ecosystem as we look forward today, it does not. But as we increase, increase its capabilities with enhanced mobile broadband, massive machine type communication, reliable latency, communication, mobile edge compute, it becomes intertwined with the cloud operating model of almost every enterprise and industry. Those industries are largely served by the ITN cloud ecosystems of the United States, but their absence and presence as providers of 5G technology as part of that combined solution creates a gap in that gap. Quite frankly, creates vulnerabilities, and it will actually slow innovation so our position is that. US policy should encourage closing that gap should pull the larger technology ecosystem into the broader 5G ecosystem, which we believe will combine with the ITN cloud ecosystems to really represent the complete surface area of technology activity within the United States and global ecosystem. The other reason for the timeliness of government action on this is that there is a technology inflection that many have talked about already. We're moving from a traditional telecom architecture to a disaggregated open software defined architecture. It will be a progression to get there, but what is happening as that architectural shift occurs is technology from the cloud ecosystem is necessary to successfully execute that architectural shift? Open hardware comes from a different ecosystem than traditional telecom. Virtualization comes from a different ecosystem. Software defined technologies origin outside of the telecom ecosystem and most cloud operating models did not originate in telecom but come from other areas of innovation and so taking advantage of this architectural shift is a moment in time to pull the US technology ecosystem more fully into. The five G ecosystem seems to be an opportunity that we should not miss now. In order to do this, specific policy recommendations delas put forward and, you know, there's quite a lot we can talk about. But the big ones are. We do believe government policy should industrialize a secure open architecture software based 5G open radio access network ecosystem for the US, Ann Farrar developed country and other developed economies, including a managed security framework. The second is we do believe in this may be in conflict to some other people's point of view on this particular discussion. But we are strong proponents that Gov. It can accelerate this shift by encouraging the adoption of open RAM solutions and mandating specific platform requirements to encourage ING adoption of these modern architectures and bringing new players into the broader ecosystem and the best way to do that is in federal solicitations contracts and standards, and then Lastly, we do believe that the US tech ecosystem is busy speaking for Dell. We have many conflicting priorities and 5G is not necessarily the top of the list, even though we are fully engaged. And so we do believe that there is an opportunity to deploy federal economic incentives to stimulate that domestic development of 5G in the broader ecosystem from the ramp platform to the telco cloud platforms to the application

marketplaces around it. Bottom line is, you know we have a strong belief that in both the adoption of the technology for innovation purposes, but more importantly, the stability of the technical ecosystem around cyber and secure supply chains. The fact that most of the US technology ecosystem is not participating. Only in the five G ecosystem is a liability, and everything that we can do to pull more of the technical ecosystem into this collaboration. To build these mobile cloud experiences would have a significant advantage and cyber resiliency and secure supply chain. And most importantly, it will probably accelerate the shift towards modern architectures. US leadership and innovation. So thanks for having us. Glad to glad to have more conversations. Excellent, thank you so much. If we could move to Pardeep from member. Yeah, can you hear me OK? Yeah. Yeah, thanks. We have been in business for 15 years. We focused on initially in the code network in the core network. You know, interfaces. I've always been open vendors have been able to work together different components from different vendors can actually work together very well, and there's a number of instances where our equipment actually works very well with. You know Nokia Ericsson or other other companies now over the last five years, we have expanded into the open ran space and open run is all about open interfaces. It's not open source and it's as secure as anything else out there in the sense that you know. Just because the interfaces are open actually makes it more secure. One of the things we need incentive is really that you know we are new player in the in the game and all the discussion regarding the supply chain diversity for for new players to come in. We're not looking for any any I guess incentives any different, it's just that we want incumbents to become open, right? And that's really the. Driver it has so our request to the government is simply that if you can force the incumbents to become open, this is no different than you know what Microsoft would happen with Microsoft that open up the browser. So then similarly you know open up the search functions is absolutely and anybody who complaints about you know open interfaces. Make it less secure. All the interfaces in the core of the network are open, right? So why only one or two interfaces which are on the edge and there many edge and edge interfaces are open as well? So there has not been a consideration of, you know why the you know oh, interfaces in the core have to be closed. So those are really the things which government has to decide. And when the other thing is the demand and supply, right? So as I said, we are 50 year into our development, we have spent close to a billion dollars invested in in developing open RAM. But what we see the demand is more outside of US. So in Europe for example, all the big four operators last week announced an Mo U where. They can't came out and said that they will stop buying the close systems and starting 2020. Three they will only deploy open systems. We need encouragement from the local US operators 'cause we've seen no activity from the top three operators of actually doing something. Deploying a real network with a real allocation of there. So what were phones and other companies are doing? They're actually saying that certain portion of their network they allocate to open rank, right? So it may be that on day one you don't jump. 100%, but they will start. You know, deploying in certain within certain fashion with a new set of players and that's the kind of encouragement we need from the local US operators where they start actually deploying certain portion of their network with the new players in with the new technology and then also for the smaller operators. I agree with the challenge they have because if the big US operators are not going for it and they are the one to actually lead the Open ran initiative because government gave \$1.9 billion. It's not fair to them saying OK, you go run with it when the big guys are sitting idle and doing not participating in this right. So we need to somehow encourage the local operators to adopt it. If they're the one leading it. Or encourage the big operators structurally did for them so that way you know the ecosystem gets built. So this

actually initial is interesting timing, because if this year goes by and we don't cultivate the ecosystem then the window will be gone right? Because people will just deploy their 5G. The existing vendors and companies like us would be very nation, very small. So if the government doesn't really help in today and this year that actually the window will close very fast and will be talking about the same thing five years from now, right? When 60 you will happen that there is no U S60 player, so that's pretty much like to say. Great, thank you so much. We have tied up next Jane from Intel. And thanks, Travis. Thanks for the opportunity today I head up to Intel's global digital infrastructure policy, so this is I think a crucial discussion and I really appreciate the opportunity to participate today. I want to take a step back and take a look at the bigger picture. 5G is really a game changer, so if you think about as individuals how 4G actually changed the way you interacted with the world with your with your phone, ordering food, checking in for flights, etc. We see the same type of. Dynamic now happening across the economy. An across our society and I think with covid everybody working from home and kids going to school from home, you really see how important digital infrastructure is an why. It's so critical to our to our country, so everything that we're doing on the supply chain. The supply side is really important in promoting 5G network deployments, sale, citing regulations, ensuring that the licensing conditions remain the same for the carriers. Those are crucial. Anything we can do on the demand side is also really important. Agency use encouraging enterprise adoption, making sure that rural and underserved individuals have access. All of those are crucial as well to make sure that we really have a digital infrastructure for across our entire economy and across our entire society. But I think John spoke really eloquently about some of the underlying issues that we need to think about as well, because it really is an age of convergence, right? It's less about a strict communications platform. And we're bringing a lot of the compute capabilities into it as we move into the classification. That's really in the wheelhouse of many of the US companies. High tech companies and some of those same issues become really important if we want to compete in 5G Ann as the last speaker just mentioned. As we move into 60 and so those turn into issues of workforce, making sure that we have STEM education diversifying our workforce and making sure the immigration system allows the companies to fill some of those critical skills. And at the end of the day, I know John said we have a very strong semi conductor industry, but I do want to note that like the Chips Act, for instance, is really critical for supply chain security and regaining technology leadership in the United States in particular. For instance Intel where I work where the last remaining advanced semi conductor manufacturer based in the United States, it's 25 to 30% cost disadvantage to similar capabilities built in Asia for instance. We're talking about like \$10 billion investments, and so these are fundamental technologies that we're going to need to make sure we have those capabilities in the US. And it's really important to make sure those underlying technologies and the workforce that we need to be able to create them exist in the United States so we can compete now. And as we move forward, because I deal with this issue globally, and I can tell you that other countries really are seeing the importance of 5G in terms of across their economy. Because it really is, as John pointed out, moving into the enterprise space and so it's not just about, you know. Individuals are people connecting via phone. It really is starting to move into a huge issue across the entire economy, and one that I think the United States really has to get behind to make sure that we're well positioned throughout enterprise and throughout agencies. Thanks again, Travis. Absolutely, and so we have Gary from the Fire Broadband Alliance coming up. Let me just make a quick note. Again, if you were on the phone and would like to participate, please shoot me an email at T Hall tha LL at ntia.gov or raise your hand. We still have room in this particular topic area for one or two

speakers. So if you are interested in participating, please go ahead and let me know I am with that. Let me turn it over to Gary. Thanks Travis, can you hear me OK? Alright, yeah we can hear you fine thanks yeah. So the fiber broadband Association commends NTI for holding sessions and we really appreciate this opportunity to speak. As Travis says, I'm Gary Bolton. I'm the President and CEO of the Fiber Broadband Association. Ann are Sociation is represents both the supply side and demand side for the full fiber ecosystem. So we have about half service providers and half vendors. I wanted to really address 3 key points. The first is. 5G is fiber. A successful and competitive national strategy to secure 5G relies on ubiquitous fiber deployment. No community can be left behind. The second point. I want to make is that 5G and fiber are critical to our nation's global competitiveness, and then the Third Point is security of supply is fundamental to our national security, so let me just kind of dig down really quickly on some of these points. So the start with the 5G is fiber. So 5G. Relies on ubiquitous fiber deployment. I mean, I think I'll do you know that the use cases require an massive capacity, super low latency, and so with all the you know the high density of our cell sites and so forth. We really need to have robust fiber infrastructure, and so if I look at some of the actual items from the government can do first is government broadband subsidies should prioritize fiber and Gigabit symmetric service to delivery. Deliver it Neil. The critical infrastructure we need for 5G with ubiquitous fiber. So ubiquitous fiber deployment will maximize 5G performance, will provide a secure 5G critical infrastructure, and we do spectrum demand and will help alleviate their rural and urban digital divide. There's been in the last Congress, there was a lot of bipartisan legislation and symmetric Gigabit, and we need to push some of those through our infrastructure bills. Here coming forward in 2021. The second point that 5G and fiber are critical to our nation's global competitiveness. So once built, fiber instruction infrastructure will support US global competitiveness. Virtually all developed nations are charging head to deploy this critical infrastructure, and foreign competitors are treating fiber as a strategic asset by upgrading technology and flooding the market. China is leading the charge. You know, the US is making great strides in pot on deploying fiber, even though. We have a great number of sparsely populated areas, then other country, and there's much more the industry can do and accomplish, and the government can facilitate to speed deployment. So some of the actual items the government can do is one is invest in R&D for next generation technology President Biden's supposed to innovate in America, which calls for 300,000,000 and R&D investments over the next four years and future technology is interesting to support America stuff. Technological lead a second key thing is enhanced workforce training and education. So far provide Minnesota Ciation along with WA and West Bona number other. Associations submitted a workforce letter to administration this week on the 27 that highlighted that five year loans going projected to create 5,000,000 direct and indirect jobs by 2025 and contribute 500 billion annually to our economy. There is a strong need for apprenticeships and training. The last point on it expand on is the security of supply is fundamental to national security. We must protect our industrial base and ensure safe and secure. Yes networks. You know we have a strong domestic industry, requires policy that not only invest in technology but addresses national policies of competitor countries that undermine the market dynamics to unfair subsidies and trade practices. As we've seen in other industry. China is excess capacity is undermining the health of the optical fiber industry globally. Currently they have excess capacity of over 300,000,000, five kilometres, nearly enough to supply to the current global markets. Combined, this excess capacity is being dumped in numerous countries, regions including India, New York and driving down global pricing and undermining profitability, which ultimately is going to impact R&D. So the

actionable items that we've outlined is that one is the government doing. And sure, I I level playing field, we need to work with our allies, address unfair subsidies. The root cause of this excess capacity, second is what you need clear criteria for trusted suppliers, the CI, the CSI S has published a list of criteria to assess the trustworthiness of telecommunications suppliers. The criteria complements the work of the product proposal. So thanks again Travis. An NTI for this round table. Great, thank you so much and I I have a Zita from rapkin if you could go ahead and unmute yourself you should be a presenter so go ahead. Thank you Travis. I'm under the tire Bonney general manager of Roxton Mobile Americas. As as you know we have developed. The 1st and still the only cloud native open architecture that has both open core Open Access and open Brandon virtual ran and we truly believe in open architecture. We think that by having an open architecture we can bring in best of breed companies and we have partnered with a lot of folks that are on this this session here today and we think that it works. It's it's commercially viable. We have scaled it both in 4G and 5G and we're seeing. The fruits of that we what we have is super agile which is very important for us because we want to bring other services on top to serve consumers and enterprises. Think it's super secure. We believe that open architecture actually provides more ways to put control and visibility into network, so it makes it even more secure. An as my other colleagues have mentioned here and also it makes it super affordable because all the cost efficiencies that you get in the system and they've done it. But this aggregation, virtualization and software defined methodology's, so we think this thing works but as mentioned. We need the support of the government just like any new technology. Any new architecture and approach we need help and encouragement and incentives from government to make drive folks into this new architecture. Just like with electrical vehicles with solar technologies, it's it's not easy for folks to move into this direction. And from that perspective we would. Like to have government too. Encourage the private sector, but especially when it comes to the government type 5G experimentation, whether it be with DoD 5G Initiative, 5 Cheetah next she initiative or with the 5G challenge coming up that they make sure that this open architecture, the virtual Rand or Rand is being considered an incentivized like we saw in the DoD tranche one. That all the awarded implementations are still the traditional implementation, so again, it would encourage support from the government in order for this to happen. So that's point number one point, #2 in terms of open architecture. Bringing in more players into an implementation and for us to make it easier for others to to come into this. And follow that the similar path that we have done this similar journey. We have created a platform that is open but also includes. And modules from from other network functions from other vendors that will make it easier for the integration. So even for rural and regional carriers, we're hoping that this will help with some of the system integration issues that they might be concerned with. Thank you. Thank you so much and I we actually only have time for one more. I know Chris, you've had your hand up a little bit, but we already heard from you so I apologize. We're going to go to Ed Peterman. Catherine, you make Ed a presenter and we'll go ahead and go ahead and unmute your mic. And and if we don't have you are are we do have you or no? OK, well, why don't we go ahead then? Chris, if you could just go ahead and. Training will be the last one in will we can hear you now. OK, OK sorry go ahead and yeah hi this is Ed Tiedeman of Qualcomm. I just like to note that I'm responsible for all of our standards and industry organizations. Activities in Qualcomm and that includes all the team that really developed 5G. In addition to us being quite involved in the development of the 5G air interface design in terms of particularly getting the bits across the air, and of course leading in the product's there for particularly the handsets are using all of our chips for 5G. I'd like to note that we were also quite involved in enhancing the security

in terms of the air interface capabilities and the network stuff. In terms of the security going on for five G and we look forward to that actually being really heavily deployed throughout the networks and such. I'd like to turn my my comments to a couple of other areas and just like to note the importance of. The opener and activities that are going on out here. Uh, trying to expand the the ecosystem and the enhancements that potentially can come with the security and the openness here so that we can actually look at and be able to examine the various aspects of it. I would also like to note that open ran in the architecture and this has been brought up by a number of other people is actually different from innocence open source in code in some sense. Open source code is. A way of implementation, but is not necessarily the only way of implementation and business models will typically dictate how things are actually implemented, because the key thing that we need to do, and to make sure that our infrastructure supply chain is actually profitable, insufficiently profitable, so that they can continue to innovate and bring the features and capabilities of five G and an beyond out to our air interfaces. Percent, by the way, is part of that whole thing. I think many of you may be quite aware that qualifies Qualcomm. We've really stepped up to really helping this happen by basically having a line of chips for the infrastructure. Also that we have announced an an. We look forward to really being helping to move ourselves into a much more secure type of system by having these common sets of chips and capabilities that can be used. And therefore we can be focusing on the key things that will really make our network secure that there's such as the interfaces and the practicality issues of making sure that the implementations are essentially bug free and not having loopholes where attacks can can enter the system. I'd like to end there other than to just make a comment. I think it's really important that we we pay a lot of attention on standards, but I think it's very important that we think about. How we address the standards as a country? Anne and 'cause there's a lot of, uh, misunderstanding, and I don't have time to really get into that at this point on on. Actually, what's really happening out there in the standardization? Um industries, or the standardization bodies? Uh, that are happening out there, such As for example, one of the things that people were talking about is oh, such a large number of contributions coming from particular players in a certain country, and certainly that is true, but we should also realize that these are not necessarily always the most organized except in a couple of cases that they are. But we need to really understand that an understand better how to approach that as companies and as governments in the United States thank you very much. Thank you so much and will show a wrap up that topic here and let me hand it over to ginger ale or associate administrator for Office of International Affairs to open our next topic. Great, thank you so much Travis and I'm really pleased to introduce our last but certainly not least segment of the listening session on how we can leverage and support trusted 5G suppliers through market and other incentives. So first I'm going to provide just a brief overview of the interagency work that's ongoing to achieve this objective before turning the floor over to the Department of Commerce. Is International Trade Administration to discuss the deal teams initiative. And then to the export Import Bank to provide an overview of their updated content policy under the program on China. Anne transformation. ULL exports. We will then open the floor up to hear from all of you an additional market or other incentives the US government could put into place to promote or further encourage international cooperation in this area. As articulated in the national strategy to secure 5G, and it's recently released implementation plan, the US government has made clear its objective to support the development and deployment of secure interested 5G networks globally, and this 4th pillar of the strategy and plan includes several components. For example, the ongoing diplomatic outreach on 5G that the US government is leading both bilaterally and



multilaterally. Another key component of this pillar. Is capacity building training an foreign assistance programming? This support is coordinated through the digital connectivity and Cyber Security Partnership or DCP, which is a multi year whole of government effort to promote an open, interoperable, reliable and secure Internet. The Department of State and the US Agency for International Development Co. Chair. The coordination of this program, which has four objectives, build connections, advance and open Internet, grow global markets and enhanced cyber security. Our ambition is that our work on 5G security and our support for trusted suppliers will help us achieve the goals articulated in the national strategy to secure 5G. So now I'll turn it back to Travis and then really look forward to hearing from ITA. Annex M will provide. Specific examples of the types of support that the US government is providing to trusted suppliers, and, of course, look forward to hearing from all of you. Thank you. Great with that, let me pass it over to Carrie from ITA. Hi everyone, thank you Travis and Jatie. My name is Kerry Ingram. I'm actually with the industry and analysis section of the International Trade Administration. I am the main lead here on 5G for the International Trade Administration. As many of you know, this central mission of Itas is to strengthen, supports competitive competitiveness of US companies in international market. We take a number of different approaches to this advancing US trade policy objectives promoting relatively in policy environments that enable US companies to compete. On a level playing field and Ramona exporting business opportunities for US companies, these elements are accomplished through a number of different programs, trade missions, reverse trade missions. We have services to connect US companies with local partners and vendors, and really leveraging in utilizing our global network of over 100 countries. But as many of you know, usually the woman ideal. It takes more than just offering the best price. For this reason we have. Understanding an initiative in ITA called our deal teams, basically bringing the entire package and suite of services for from the US government government to help you. US companies when deals and what do I mean by the entire packages package and suite of services that includes our team called our advocacy Center that leaves on engaging with government decision makers are in country specialist. Provide on the ground support industry specialist here in the headquarters of Department of Commerce and bringing in also different relevant officers from the State Department and other agencies to bring in other areas of expertise and then also looking at the finance arm. Which of my colleague will cover in a minute about different financing. An Anna finance development opportunities through X MDSC, USDA, and. Other agencies all is really central to making sure that other countries and decision making. This decision makers no US technology options and that US companies have the resources they need from the US government to help them win deals. And so if there's any interest or questions to learn more about the build teams and what we can do to help you out, feel free to reach out to me or any other Contacts at the International Trade Administration. And with that I'll hand it back over to Travis. Thank you. Great, thank you so much an if I could Reza from the export import Bank if you'd like to unmute. Hi yes, thank you. My name is resonant Pearl Jam on the head of business Development for Global Technology Sector at USXM. So privileged to be on this call with all of you for those that are not aware XM is the United States official export credit agency with the mandate to support creation of US jobs by financing export of US goods and services. We do this by a host of financing products. Short-term exported focus. Solutions and also medium and long-term buyer financing for international buyers of used goods and services. We are the lender of last resort engaged to level the playing field for US exporters. Make sure it can compete effectively in the global market. We also have a significant technology and telecom focus as part of our 2019 rechartering. We have a new mandate to dedicate 20% or roughly \$27

billion. Of our annual financing authorization to support Trans Formational technologies that compete with state back Chinese players. This authority provides us additional flexibility's that would help counter to the extent or to the extent practicable, practicable match the terms offered by Chinese competitors. There are 10 sub sectors of technology that this applies to. 5G and wireless communications, fintech, quantum computing and semiconductors, or some of the relevant ones for the participants on the call. As Jason noted, we also have a new, revised recently revised content policy. Reducing the content eligibility requirement of our medium term and long-term transactions applicable to the 10 subsector technology subsectors that I just mentioned. The content eligibility threshold for these products used to be 85% US content. Now it is reduced to 51%. He was content which means as long as an export constitute 51% was content X and can look at financing pretty much the entire transaction costs. For transactions that have a below 51% US content, we can still consider providing financing for those as well on a case by case basis, as long as they need some additional eligibility criteria, such as their significance from a national security and interest perspective and also the US Exporters written plan committing to significantly shift you a supply chain and jobs in the US over the next three to five years among some other factors and Lastly. This policy revision went into affect a little over a month ago and the bank is working diligently to develop a detailed implementation framework and criteria to operational operationalize the policy by March 31st of this year, so additional detail will be made available to the public over the next few months. Thanks, I yield back to you. Thank you. Thank you so much, really quick taking the time to do the housekeeping again. If you were on the phone and would like to participate, please shoot me an email at T Hall tha LL at nt.gov with your phone number and your name organization. And if you'd like to participate on teams, please raise your hand. Let us know who you are in chat and with that let me pass it over to Eric from Samsung. Thank you Travis. Can you hear me? I can indeed, yes, great. Well we appreciate NTI hosting this conversation today. My name is Derek Markham from Samsung's DC office. Samsung has made major US investments and has become a global leader in 5G chips, devices and network equipment, all from an integrated, trusted and secure supply chain. 5G is widespread throughout our device offerings in the last two years Samsung introduced a full portfolio of Galaxy 5G phones from mid range devices like the Galaxy 851 five G2 flagship smart. Smart phones like the Galaxy S 21 to category changing devices like the Galaxy Z fold two Samsung is also released 5G enabled PC's and tablets. We introduced the world's first millimeter wave 5G telematics control unit for connected cars and last year Samsung Verizon signed a strategic partnership agreement for \$6.6 billion / 5 years to supply network equipment and solutions for Verizon's next generation network. We're supplying 5G network equipment to meet your cares in the US, Korea, Japan, Canada and New Zealand and yesterday we joined Deutsche Telecom. In announcing the first 5G standalone trial in in the Czech Republic. And just last week our 5G ran equipment was the first 5G network equipment to receive common criteria certification in the US in Canada, while cyber security is necessary, it is not sufficient in the global deployment of secure 5G trusted supply, which was a cornerstone of the May 2019 product. 5G security proposals is a separate and equally important issue. To start, the US government should encourage the international community to operationalize the product proposals. US government should also pursue three additional policy goals to. Go global deployment of trusted and secure 5G. 1st. As runs, it just mentioned the eximbank needs more flexibility to support trusted telecom deployment. XM is limited by law to promote US exports meeting you as content and the telecom sector has a very globally distributed supply chain. While some adjustments adjustments, US content rules in December was a good start, XM needs

to be more agile and active and supportive. Global trusted telecom deployments, second Development Finance Corporation of the DFC needs more flexibility from Congress. And where they can support telecom network deals. While 5G is rightfully a top priority for the DFC, they're currently constrained on where it can operate. A model is the European energy security and Diversification Act, which eases DFC's less developed country requirement for energy infrastructure projects in Europe and Eurasia, just authority for energy projects which provides commercial opportunities in upper middle income countries that may have both strategic and development benefits should be extended globally for deployment of secure and trusted telecom infrastructure. And 3rd and finally, Congress needs to sufficiently fund the multilateral Telecommunications Security Fund, the Mt Fest F. XMDFC have certainly a very important roles to play, but the MTSF is needed to. The fiscal year 2021 National Defense Authorization Act established the MTSF as another tool to help trusted suppliers globally in cooperation with Allied and partner governments. However, the US share this fund is yet to receive and authorization. Amount or Appropriation is selling the Senate Intelligence Committee. Last year. Recommended a \$750 million appropriation for this fund. We agree with the implementation plans recommendation in 4.2 that cause an adequately funding the Mt SF5G is essential to economic opportunity and the US and other countries cannot afford to slow down a heavy handed regulatory apparatus will stunt. 5GS for the US should lead through market incentives and strengthen policy tools. Such as the ones we just mentioned to encourage international cooperation around secure and trusted 5G5G deployment globally. Thanks very much. Great, thank you, Eric. Just as I was holding up my pink one minute sign up we could get Brian from Nokia up next. Brian if you got him, you unmute yourself. Can you hear me? Yes you can. Thanks thanks Travis. Thanks Trisha. Wanna start my comments internationally and then if I have a minute I'll come back as I did want to follow up a couple of points on the domestic front. I want to associate myself with some of what Eric said as well as Carey's comments in the multilateral context. There's a lot of opportunity for the US to work with its partner nations. A lot of interest has been expressed and how to make export credit agency financing more broadly available. The capacity building. Is an enormous investment that will have to be an A multinational approach. Ultimately, China is the the Big 800 pound gorilla in the room here that we're not talking about, and I'm not alleging anything that's been done wrong, but we have to be cognizant that they've made enormous amounts of investment in that kind of capacity. Building foreign direct investment support, institution building, and a lot of markets that US and another Western suppliers are very eager to make inroads into. Those governments are trapped into a really tough situation where if they limit their ecosystem to trusted suppliers, they're worried about losing that investment. So I think the multilateral approaches that bring more capacity, building more training, more bilateral government cooperation is essential to allaying those fears and creating opportunities. I think 2 one thing we haven't really spoken a lot about is that corruption, particularly outside the US market, is endemic in procurement. That multilateral approach. Those multilateral government engagements, the capacity building, those are all very import. An opening lines of communication to be able to intervene with governments where we see activity from the non trusted suppliers which isn't limited to whether their equipment is trustworthy, is whether or not they conduct business the way that we do so ensuring fair and open procurements, you know, is an essential step. Then I think you turned to the world financing, and here I'll endorse Eric's comments. The XM developments in December were a very good step in the right direction. Unfortunately, most financing from XM will remain unavailable to microelectronics manufacturers, given both the nature of how they count that

content, things which are not attributable today. That should be like R&D. That is done in the United States in terms of product development. There are other esoteric rules about. Even if you purchased from AUS manufacturer, if it doesn't ship to another location on AUS flag vessel for purposes of manufacturing, it won't count this content. So hitting even the reduced threshold is extremely difficult with these rules. These rules are very out of step with what the export credit agencies and the rest of the world do and we have to continue to work with XM to given the tools they need to address that. Another issue around this? Do you have seen an for XMS consideration is there's always CD guidance that deals with the rates that they can lend at relative to the commercial markets and here the Chinese Development Bank is simply not bound or simply chooses not to follow that guidance. The practical result is often times when we get letters of interest from XML DFC there at rates pegged to local market rates, but those are not competitive with what's available to to some of the operators, so we need either to change the way we interpret that guidance, or perhaps on a multilateral basis. I know Finn Vera has some interest here. We need to get always CD to recognize that the CD be given its size actually should be part of the calculus of what a commercial rate is. We don't just look at local commercial banks, we look at what's available out there to pack our rates to. Otherwise the financing. Even if we get content rule right, simply not going to be competitive. Those are those are key things that we need to do. Ultimately I can speak more if there's time for Q&A, but I did want to circle back very quickly to the to the prior panel because on the. Honey issue of of Orion I think while Nokia is a large scale incumbent, we've also been by far the most forward leaning in terms of driving the open ecosystem, writing specs in the O ran alliance. Part of all the groups were in every market deployment involving open interfaces today and were in groups like the Ram Policy Coalition where by the way it is the stated objective, an principle of the group that government shouldn't be in the business of mandating technologies or architectures. Or using procurement preferences. So I was a little mystified to hear that suggested so broadly by members of that coalition in the prior panel. That's the wrong direction. There are a lot of things the US government can do both domestically and internationally in the way of creating the kinds of live network test environments that will prove out the technology and overcome some of these barriers to wide scale adoption. There are questions, right or wrong about performance and security, all of which will be cleared up. When we have live network environments in which you can mix and match vendors and demonstrate that you don't have to trade security and you don't have to trade performance, but we need to invest in that. That's the development and the demonstration capability of RND. So Commerce Department's got a pile of money that hasn't been fully appropriated. Packaging wrap up thanks. OK, let's focus on creating innovation beds like that and not focus on trying to drive people to to particular mandates based on business model. That's a bad idea. Thank you so much. If I could get Ian from Addis on the online next. Yeah, hi everybody, this is in shop for us. We've heard a lot of great comments from from Ashes members, both industry members and governmental organizations who participate already. For those of you who don't know us, where DC based organization, we're founder in three GPP aren't we are the North American regional partner in that organization, so we provide the regional membership path for three GPP are we also in coordination with our members, promote American interests there and we think that the the activities here too. Strengthen that that coordination we really welcome. Um, we see the issues of security and trust needs to be tackled broadly and culturally and in the context of standards. That means not just considering the bits and bytes of the technology, even though these are critically important, but also the strength of our regional participation and the clarity of the goals that we bring to standards. And we think

creating that synergistic relationship between trade policy, technology products and standards which has been done successfully. Other regions is really going to help strengthen the US position as well. I think a key part of that is to really think about our domestic regional needs and former regional plan for North America and in the US as a sort of fundamental starting point on which we can build our international participation as well. One of the artists activities that we're undertaking to do that is to launch the next day Alliance, which has brought a very strong group of companies, including some of the sort of companies you don't traditionally associate with telecom sector. And we come from today as well to look at the whole life cycle for the future of five G and also the next generation. Uh, this is going to start with the development of a national 60 road map, which we think is going to be very important and we really welcome input and coordination with the government and the private sector in developing that road map. I think, as we've heard from from many companies today, we think that technical engagement in Standard should primarily be through the private sector. But we have a concern and we deplore the kind of sometimes Geo politicization of that standard process. I think from the North American POV, our point of view is that we want to be robust in asserting our requirements, but we don't want to exacerbate that Geo politicization. So we want to call Keeper Sandwich process that is driven by technical requirements where we can really open the market and provide competition and a diverse set of suppliers through the standard process. I think one of the particular challenges in North America is the long life cycle of standards and mobile technology. We need to sort of pursue goals that can sometimes have a a time span of more than a decade. Um, and we really see the importance of government in promoting that kind of long term private sector activities that encompass research standards participation, and pre commercial trials. Well, I think that can be partly a cultural promotion of the importance of those activities. I'm partly considering economic and financial incentives, for example through the taxation system to some of those activities. I think in addition to the kind of thought and technology leadership that we've heard about, we also need to have a process to be able to verify the trustworthiness of equipment. In at least we have a supply chain working group which was created in response to buy to request by the DoD. That's great such a process and this is stimulated. A vibrant and international group of companies that are collaborating to define steps that can be the foundation for a short 5T certification audit process. And I think not only is this working put his own right, it's also providing a model for how the government, through expression of its needs and requirements, can stimulate the private sector. And I think this ability for the government to articulate its needs and to have a single voice where those we can sort of understand those needs, is important both through the. Supply chain process and also in developing a strengthened POV in standards. So in summary, we believe the US already has many strengths and and good collaboration structures in the 5G arena, and we want to see these being leveraged. But then we need believe they need to be bolstered by more active regional planning, including creating incentives for industry to make substantial and long term commitments to international standards process and developing collaboration between the US and its international allies. And we welcome the opportunity to present to be part of that process, and we wish you good luck. Thank you so much and again, let me just simply say if you are on the phone and wish to participate, please send me an email at THALL at ntia.gov if you are. On teams and would like to participate, please raise your hand and let us know who you are and we will do our best to get you included. And with that let's go to a meat from Verona Networks. Who's on the phone? I mean, if you could press Star 6 to unmute yourself that would be great. I mean, if you could press Star 6 and see if we can get you. Thanks Travis, can you hear me now? Yeah, we can hear you much for the opportunity to participate in

this session this morning. My name is Amit I'm the Co founder of Venture backed 5G Radio Access network startup called Verona Networks and I just had a few remarks from the perspective of. Off basically of new entrance and startups. So, uh, I just like lot of other people, have. Other speakers have mentioned before. I think the US should push for open interfaces in the radio access network. So of course domestically as well as the worldwide. I think that's still really help in creating a level playing field for new companies that are trying to enter the market and it also reduced risk for seventure investors, so we're looking at the space who are willing to fund companies, but worried that these companies would not be able to get their products into the market because of the proprietary interfaces that incumbents have. So I think that is that should definitely be done. I think the second the issue that a lot of new vendors face is that when we take our products into market, we customers expect us to conduct like technology trials that can take a long amount that can take a lot of time. And of course these trials that critical for us to prove the value that we are bringing. But they are quite expensive. So if there are so, I think it would be interesting if there are financial incentives or help that can be offered to new entrance. As I stare, conducting trials with customers, this could be similar to the structure that, like NSF users, where there are additional grants. If you know people who have. Researchers are able to find customers for their technology in the same way. If new entrants in this space are able to find the service provider, customers who are willing to work with them domestically or internationally, I think those activities could be could be supported. And Lastly, is considered the radio access networks still remains the principal hardware intensive business, so of course there is a lot of things that we are doing in the software side, but at the end there lot of radio hardware. So actually video transmitting equipment that goes in cell towers or small cells. This is unlikely to be off the shelf hardware in the the next. You know it may be for a very long period of time and I think if there are activities that can support new companies during the hardware manufacturing scale up process when typically profitability and margins are very low, I think that could help. That could help the new entrance of scale, their scale, their businesses and then. Reach reach a size where they can sustainably support these hospitals. This is so so, so just three Marks and thanks again for the opportunity. Thank you so much and if you could just remember to mute your phone an if we could now turn to Jonathan from the Atlantic Council Jonathan, please go ahead and unmute yourself and. Thanks so much for giving me some time. I think some of you may know that Elena Council has been holding a few meetings March of last year and December as well. Looking at how government and the private sector and some of our international partners can work together on this issue, I think there's been a lot of great comments throughout today about how that cooperation is evolving. Our observation. Going back to the study released in November of 2019 is that. The government has some difficulty understanding deeply the sort of amalgamation of tools that are going to need to come together to compete against a vertically integrated competitor with essentially unlimited financing. A lot of the comments that came out today talking about Eximbank's recent flexibility are really important steps forward, but it in our view it's going to require a centralized organization that understands all of the variables that go into these deals. If you look at the sort of history of the United States government's involvement in commercial deals, there's been tipped. You know, a resistance to participating in, for example, the negotiations for a telecommunications deal that is unfortunately going to have to go away because, you know, the competing governments are participating hand in glove with these deals, and we've seen a lot of deals sort of fall apart when a commercial companies left on their own to do these negotiations. So it's really great to hear the comments from ITA. I think NTIA has a really great opportunity here to do some really massive work for

both the participants on this call and importantly, from our perspective, the nations that are really exposed to a significant amount of risk across cyber security or even sort of societally. So you know, one of the key things that we were just emphasizes the need for an organization, and maybe that's NTIA. Maybe that's somebody else to really focus on. Bringing all of these parts together because as we did our study and looked at this problem talking to industry, talking to international partners, there's certainly a huge desire outside the United States for a another solution to compete with wowway. It's very unlikely that solution is going to be one company, whether that's from Europe or otherwise, which means that there's going to be need to be an integration activity, and it's likely that integration activity includes a lot of software which the United States has traditionally been. More successful at deploying so unfortunately this is going to be sort of a test. I think for any government, any sort of United States leadership because it's going to require a deep understanding of what bits of software are very valuable. Anwen. How can those work together with traditional providers like Nokia and others, and where can standards and all these other parts really play in? And the reality is, you know there's a huge amount of money available not just from. You know, research grants from NSF and otherwise, but from procurement activities that the Department of Defense will have to do over the next five years. If we can spend that money somewhat intelligently in the same way that our adversary is spending it incredibly intelligently, I think we can get a very large amount of progress through 5G and head towards 6G in a state where most nations sort of feel more secure about their telecommunications infrastructure. Think the one last thing that we haven't talked a lot about is building an understanding. The right ways to deploy the use cases that will actually make the economics of 5G makes sense, because right now just deploying a lower latency you network doesn't seem to be proving to make economic sense. Even in the United States. So whether it's health or education or some of these other initiatives, if we can roll together, you know some of the efforts that are coming together, whether that's through the IMF stimulus that's coming in, coming around, or other parts. If we can drive using the use cases with these technologies is. Being a supporting function which there supposed to be, we think that there could be a lot of progress in this sort of competition because the adversary is selling a network and not necessarily the capabilities that go on that network. That's all from me. Excellent, thank you, so thank you so much and we have Courtney from ITI or any if you could unmute. Hey thank you Travis Courtney Lang with iti here. I have heard a lot of good comments already so will not necessarily get into great depth on some of the financing questions that we've just heard from from both Brian and Eric at Samsung about. I would just say that we are certainly aligned with their positioning with regard to the importance of creating that multilateral telecommunications security fund as well as thinking about. Weather DFC funding can be shaped in a different way. We also welcome the positive developments in December from the EXIMBANK, but recognized as some folks have mentioned here, the need for additional flexibility. I think two other points that haven't been mentioned, but I really wanted to stress are one we would really encourage the US government to continue the advocacy that you guys are already doing through both. Both excuse me, multilateral and bilateral engagements I think. The work of the digital connectivity and Cyber Security Partnership has been something very useful and something that we would certainly love to see continue. That's been, you know, I think a way that that you guys have been able to really shape some of the conversations in global government policy making, etc. As you do that, certainly we would just encourage a continued conversation with industry, particularly because there are certain markets in which some of the arguments that. I think we've made both as industry in US government are not necessarily persuasive given some of the positioning and

financing issues that certain governments are facing. So I think you know, partnering with industry, especially those that are on the ground, can really yield some more persuasive arguments. So that's one area that we would love to see continue. Same with engagement in the in the prod conference and Associated Prod proposals. We think those are really important starting place and would continue. Or would like to see continued engagement on that? Particularly, I think somebody mentioned this earlier, but in terms of implementation and figuring out particularly how to operationalize those, that's something that we would also welcome further engagement on. And then, I think another area that's incredibly important is really continuing and expanding if possible. Funding for both 5G and cyber security related business development, trade missions, an reverse trade missions, an other events that are led by USTA ITA. And USAID, I think those present really valuable opportunities for businesses and potential customers in foreign markets, and are certainly something that we would like to see continue. We have a lot of other recommendations that we've set forth in our global 5G policy principles, which we released earlier this year in June. I think they kind of run a wide gamut of recommendations. So split into four buckets. But I think actually taking a really holistic approach to this, not only looking at domestic deployment, but then also figuring out. How we engage in a more productive way with our international partners will be incredibly important as we seek to really bolster the US position in five G and so certainly would encourage you guys to take a look at those as well. We've heard standards mentioned a few times as well. I think you know there are some interesting. Proposals that have been thrown out there, and certainly from us. We would just encourage the US government to really continue to support industry lead bodies with transparent, well understood rules based processes in place. So with that being said, thank you so much again for hosting this session today and we look forward to continuing to work with you guys moving forward. Great and thank you so much and will closeout. Chris has been has very patiently had his hand raised for awhile. Chris go ahead and after that we are going to close with Evelyn. Yeah thanks, thanks Travis. I just wanted there's been a little bit of debate on the call about open ran and where it stands and whether it's ready right now, etc. I just wanted to offer a very quick two cents coming from one of the one of the operators and what I really wanted to say is that there was some implication earlier on the call that some of the big US operators are not supporters of open ran. You know, I just want to say that from at least from the perspective, I think all the members of the open Ram policy coalition. There are multiple operators or members and were all strong supporters of open ran. I mean, we founded the open Ram policy coalition. You know we are sharing the O ran alliance, so there's a lot of activity going on within our businesses to support open rain, but it's an apples to oranges comparison to equate our situation here in the US with Vodafone and Telefonica are doing in Europe, which I think the Mavenir CEO implied they have a much different situation because they're looking at replacing wowway equipment. They have played in their networks. You know these for a lot of the Co operators in the US, none of us have really used wildly equipment and other major. The large scale national operators an so our incentive structure is different. We're focused on is trying to integrate. You know new technology with legacy networks, and that's a really complex and ever it's going to take time to do so. One of the reasons we founded the Open Ram Policy Coalition was to push on things like with the right level of investment and with government providing the right set of incentives, not mandates. But the right level of incentives we can actually make a down payment on the future, we can ensure that the technology develops and then down the road it will create an opportunity for companies like mine and others to use it. But the extent to which we can actually deploy right now in our existing networks as we're building 5G. That those are relatively



complex technical issues that I was going to kind of wait for the February meeting to explain that more. But there's some challenges there that I think that's a. It's a great segue. Thank you so much. We, for those of you who are online, we do have a second one of these listening sessions happening February 25th. Same time, same bat station, will probably in different teams link, but please keep keep on. Keep your eye open for details on that. And with that, let me turn it over to Evelyn to close this out. Thanks so much, Travis. Thank you to everyone who participated today. We've gotten so many great key takeaways and feedback will be building a proceedings report around the great recommendations today to fair to share with our federal leaders. So thank you. If we did not get you today, we know it was a quick clip. Please email us with your comments. Also happy to accept. Any comments on the format for the session I can guarantee you that Travis is a pink one minute sign will show up again for the February session. I think that's a standard now that will have to keep. But again, we appreciate your involvement and the next session will be on February 25th also from 11:50. And with that we'll leave it there. Thank you so much. Thanks everybody.

### **5G Industry Listening Session: Vendor Diversity Transcript - February 25, 2021**

You're unable to comment to free to shoot me an email or she are, you know, get in contact and we're more than happy to make sure that your voices are heard. So with that we are at 10:00 o'clock and let me go ahead and turn it over to Evelyn Romale are acting assistant secretary and current admission. Thank you Travis. Good morning everyone. Thank you for joining us this morning for our second 5G industry listening session. It's hard to believe that it has been almost a year since we've been working in a mostly all virtual environment due to the pandemic. Thank you for your commitment to our partnership. During that time. I think we've learned a little about supply chains over this last year. Industry has looked into this issue. Thank you. For the task force with the adjust the supply chain Task Force for doing that and last night the President signed a new executive order to study this issue more closely as well. That's why our work here this morning and work on this issue of 5G vendor diversity is so critical. So let us begin. In this session, we are focused on the policy goal of ensuring that 5G networks allow for a diverse competitive market supplied by a range of vendors. Vendor diversity is vital not only into the economic vibrancy of the 5G market, but also to our national security interests. Fostering a reliable, trustworthy, and diverse supply chain for 5G networks that are open by design can accelerate innovation. And resiliency by unlocking the market. Departments and agencies across the US government are working with the private sector, academia and international government partners to adopt policies, standards, guidelines, and procurement strategies that reinforce 5G vendor diversity to foster market competition. Recognizing the importance of this topic, we recently established the Interagency 5G vendor Diversity Working Group to coordinate and enhance US government efforts. To reduce barriers for new market entrants, increase the diversity of vendors offering. I've do network equipment and services and promote the development of open interoperable networks. We are also exploring the tools display technologies, policies or other government initiatives that can be used to achieve our goals of a more diverse and resilient 5G ecosystem. Of particular interest, interest will be the ability to deploy 5G networks using open architectures. First, this morning we will be looking at level setting, discussing the various technologies currently deployed and under development that would enable these goals. Such as open radio access network, sorrow ran an virtualization. Next we will discuss the ways in which the US government either is currently or could potentially

advance these technologies domestically. Finally, we will dive into how the US government should be engaging internationally to ensure that the global marketplace allows for a diverse set of vendors to compete up and down the network stack. I will now turn it over to Ruth Berry of the National Economic Council who will provide a few words. Thank you, I'm pleased to be here today and glad to have the opportunity to say a few words so I'll keep it brief so we can get to the bulk of the session, which is really hearing from all of you on your views. The Biden Harris administration views 5G security as a high priority and continues to engage with partners and allies around the world on the importance of using only trustworthy vendors for their 5G network build outs. In addition to working with countries on the risks posed by untrustworthy vendors, United States is also working with allies and partners to support a vibrant and diverse supply chain. A trustworthy telecommunications equipment and services. This includes support for open, interoperable approaches like open ran technologies that promise to increase vendor diversity and market competition, and has the potential to lower costs and improve security. Were very grateful that you are all here today to help give us your ideas on how the US government Canmore successfully and efficiently promote these ideas and we're looking forward to hearing your comments. Over. Thank you so much truth. As I stated earlier, this first session will allow us to level, set and discuss the strengths, weaknesses and hurdles for using various technologies and tools to achieve the open architectures that will drive vendor diversity in 5G. These developments seem to reflect a market transformation that is embracing architectures that are open by design. We view open by design elements as including open radio access networks open and interoperable interfaces. And virtualized implementation of mobile network elements, all driven by standards developed through open and transparent processes. Open by design. Also captured significant interest by governments working can sure that the global next generation communications ecosystem is open to best of breed interoperable solutions and an open and competitive marketplace of particular interest in this regard, as evidenced by the conversation during our last listening session, is open radio access. Networks are open. We have heard from many stakeholders about the degree of maturity of various ohren models. As well as some of the possible current challenges. We are excited about the potential that Iran holds can enable interoperability and prevent single vendor lock in a key policy goal for ensuring a vibrant, competitive market resiliency and national security. While it is still maturing or run. Also seems to have potential to enhance communication security outcomes, such as by enhancing operators visibility into network functioning. We're further interested in exploring other tools such as open source and virtualization. That would enable open architectures. We're looking forward to hearing directly from you on the benefits and challenges you see, and importantly, what needs to be done by the US government to remove any barriers that may be in place, either technological or matters of policy and regulation. Let me now hand it back over to Travis, who has some additional housekeeping notes, and then we'll jump right in. Thanks again for being here. Great, just for those of you who are joining again with the Equitable Way. OK, great. So everyone could make sure that they are on mute. OK, so we have a few housekeeping notes I will be calling on provokes to present and then we will. Allow for a probably 3 to 5 minutes per presenter. Please if you want to present, please raise your to use the raise hand function. In the chat and we will make sure that you are able to to to participate if you are calling in from the phone, please email me a T haul at ntia.gov again tha LL at ntia.gov and we will make sure that you are also in right now let's go ahead and turn to Umar Javid from the FCC to give a brief update and we have a few people pre kyoudan then I have already see a couple of hands and will make sure that we get to you as well. I once more time this is public, it is being recorded. We are

going to be posting it to our website so please make sure that you are doing things that you want to be posted publicly to the website though. Thank you. Good morning, thank you two NTI for hosting me secure. 5G deployment is a top priority at the FCC so I appreciate your 40 min opportunity to talk just for a few minutes here. About our recent work in this space we know that when the FCC and NTIA work together as partners, agencies get great results for the country. Let me start by noting that in December, Congress gave the FCC marching orders and top among them with implementing the secure and trusted Communications Networks Act. This law calls for a one time replacement program for many regional carriers to make an enormous technological leap for the future of secure and reliable networks. And that's important because the damage from recent supply chain attacks demonstrates the need for a coordinated multi faceted and strategic approach to these issues. So I'm excited that NTI had convened. This group were productive discussion about gender diversity, 5G security, and the path ahead. And here's how the FCC can help. Yesterday, Acting Chairwoman Rosen Wersal announced a new formal inquiry to explore open radio access networks in the United States, including the opportunities they present the risks and challenges involved and with the FCC can or should be doing the fostering success. If adopted at our March meeting, this inquiry will compile the first comprehensive an public record on the status of open ran development and deployment in the United States with the government can be doing to promote the concept and how to support new entry into this emerging market. Don't stop here by noting that we're taking this inquiry at a pivotal time for our nation service providers. Many of them are currently considering which equipment to deploy as they transition to 5G, or as they pull out insecure equipment, and so we hope that the information developed in this proceeding can help carriers make the best decisions for now and the future. And I hope all of you will consider participating in helping us build out this record, so thank you again for the time I look forward to working with all of you on this topic. And of course all good ideas are welcome. Thanks. Great, and with that, if we could make Diane Ronaldo a presenter and Diane if you could share a few words. Great good morning everyone. It's so wonderful to be with you and Travis. I appreciate you pulling everyone together into administrator Romale. Congratulations and great work on presenting. Open ran in educating people further on these issues. I'm dying, Ronaldo. I am the executive director of the Open Rana Policy Coalition, a coalition of 61 global companies that not only spanned the globe but also the mobile ecosystem. I think the diverse membership of our coalition shows that in order to promote open ran, companies need a healthy ecosystem from each end of the spectrum. So it's great to see everyone come together and talk about what we can be doing to encourage. The deployment of open ran when we look at policy, there's really two sides to the coin you policy makers introduce legislation that restrict actions and policy makers can introduce legislation to encourage actions. We've been discussing this issue for many years now and the focus has been on the more restriction side of things, so it's great to be able to work with the Coalition to talk about what we can do is an industry. How can we work with government in order to promote open ran and at the Coalition we really focus on three pillars. Funding USA Telecom act. We're excited to see what NTIA comes up with over the next year, working with at the FCC on replace, and I also want to thank Omar and the Chairman, Rose and Wersal for the Noid. We're very excited to dig into that one. The second is public private partnerships. How can governments and private industry work together to promote innovation, especially in the open ran sector? While we do not advocate for mandates or prescriptive heavy handedness, governments can provide that stamp of approval. Thumbs up that open drain is in fact ready to be deployed and is being deployed today. And Lastly we focus on international cooperation and collaboration. There are

many developing nations around the world that have been in conversations about how to best to get open rent out there. Many developing nations have USAID International Monetary assistance for the more developing countries. How can we work together to pull money to ensure that the developing nations? Or making trusted decisions in building out their networks. But the most important part of our work at the Coalition is education and it's events like these that help get out our message about open ran about what it is, what it isn't. And so again, I appreciate the opportunity to present with you today. It's great to see so many familiar faces and I will open and send it back to you Travis to send to. To focus the conversation, thank you. Great, thank you so much Dan. Let's turn now to David Hutton from tip. That's great, thank you Travis. Um, I'm going to try and save it. Share some slides if you don't mind, if maybe you can tell me if you can. If you can see them. Great, thank you very much. My name is David Hudson and I'm the chief engineer of the telecoms, infra projects. I think it's quite clear that open run is a big technology that is gaining a lot of significance in the industry today and that's because connectivity is a large part of bringing economic value to to the industry and not just to the telecommunications industry but to consumers and within the 5G era other industry sectors as well. So whether we're looking about. Connecting the unconnected or industry foot on 0 wireless manufacturing or bringing connectivity to healthcare, I think 5G and open round are gonna be playing a large part of that. However we need also need to look at the business case economics behind this. Deploying new equipment requires a significant impact on capital expenditure and operational expenditure. So whether it's new equipment on the site, cost of installing that cost of having backhaul fiber or wireless connection. Operating it, there's a large level of impact now. Unfortunately, that is not always offset by the revenue that is generated by the use cases. So there are two ways of looking at this. One is from the operated perspective. How can I start to look at new revenue streams to try and balance the margins a little bit better? And from our perspective within the Telecoms Infant project, we're looking at a new approach to telecoms network infrastructure to try and lower the cost and build networks into point networks. In a very different way, we believe that is by doing it in an open and disaggregated fashion. We think that that's going to add to a more robust and flexible supply chain or higher speed of innovation because we're bringing in new players new vendors into that ecosystem. And but in the network economics overall as well. But before I start to address those I I wanted to do a presentation here because showing you what there's a disaggregated network approach is always easier. If I have a diagram in front of me on. A very visual person and in that respect, so if you look on the left hand side of this diagram, this is currently how the the radio access network is. Is Bill today and it's very much a single vendor fully integrated approach. So the software and the hardware components are from the same vendor and the interfaces between them linked to the same vendors equipment on the other side as well, whether that's on the sell side or distributed within other parts of the network. Now what we want to do is move towards a more multi vendor. This aggregated and interoperable radio access network where we open up these interfaces so that you could have multi funded deployments between what is on the sell side. What is an aggregation points and what is on your edge technology as well, but not only that, we want to make sure that we can separate out the hardware and the software layer, and by doing that you can actually drive down costs because the hardware should be based on commercial off the shelf equipment which is readily available and you move a lot of the complexity into the software layer. What software lifecycle is always a lot quicker and there are a lot more software innovators out there that we can start to build that more sustainable supply chain on and generate a love of innovation there. Now with Ender can start to play a part in deployment of radio access networks, even if they

don't have a tightly down integrated solution with hardware and software together. And we think that's really going to stimulate the ecosystem. So the telecoms infra project. What do we do? Well we understand it's funny we don't write technical specifications but we take in the commercial interest from operators and priorities that they have and match up against what vendors can actually support within their implementations now and also in the future that helps us to build technology, Rd Maps and build a set of product requirements documents that vendors can build towards now as part of our testing validation process which we believe sets us out completely from. Other organizations we hardly and we test those products from product level testing to integration testing. End to end testing, field trials and deployments and along all of those different stages, we issue badges through our testing, validation program and showcase those on our tip exchange, which is an open marketplace and those badges reflect product level maturity of those particular open round products. Not only that, what they've been tested against in terms of other vendors, hardware and software support as well. And that's really important if we're going to try and grow this ecosystem, we have to show that we can have confidence that what comes out of it satisfies commercial demands. And this commercially scalable as well, and to finish off, I just wanted to show you a map to show that the solutions that are coming through Tip now with open round. But also we do things on packet transport and call networks as well, is becoming a global commercial reality. We have number of field trials and commercial deployments taking place globally. A particular point in the US we have a lot of work going on with dish at the moment and we're looking forward to growing this ecosystem with your support as well. So with that, I'll stop another hand it back over. Thank you so much I if I could get John Baker made into presenter please. And John, you should be able to meet with you. Thanks thanks. Thanks Travis. Good morning everybody. Thank you for the MTA for holding this second listening session. I'm John Baker representing Mavenir US headquartered company and a pioneer in virtualization for the last 15 years plus and you have some very large virtualized networks around the world. We already have open ground deployments underway in a lot of the continents, including Brazil, UK, India. And the US and we're helping build. At the Dish Network as the 1st standalone 5G network with open ran, Africa's has been really to promote open by design and enhanced vendor diversity and you could achieve both of those with open ran. First, let me speak to the terminology. When the industry says open, you know we mean not proprietary open interfaces between disaggregated components of the network allows for interoperability, leading to a robust mobile ecosystem and diversification in the supply chain. We use the term open round to refer to disaggregated radio access network functionality built using open interfaces specifications, where the elements from different manufacturers are producing interoperable solutions. Open ran can be implemented in vendor neutral hardware and software defined technology, and this is actually shown to be working today in DISH and other other operating networks around the world where there early early trials are taking place. Open Rand is different from Iran. An important to have that clarification or an is the Orion Alliance which is redoing the fundamental work of cleaning up the specifications and making sure that we have truly open and interoperable specifications for equipment. Today, you know, just two trusted manufacturers really control the whole of the mobile ran ecosystem. These manufacturers provide closed proprietary equipment. You know, blocking other vendors from equipping or servicing mobile networks. We can end this stranglehold with an expand our supply chain by requiring that the ran be built under Openwrt and principles. The US is at a crossroads, you know. We think US policymakers have underscored the critical importance of safeguarding our telecommunication networks from certain foreign adversaries and advancing US leadership in

the mobile telecommunication space, including five G. While US policymakers have taken some positive steps, governments from you know, South Africa, South America, Asia, Europe have really been in advancing aggressive policies to build their next generation mobile networks with open ran and preferencing local suppliers to do so. the US is actually really behind in this process, and you know from where we started 2 three years ago, the US is now falling behind the rest of the world. Open ran is so transformative that the last five months, you know we've seen five major operators sign an Mo U committing to deploy open round across the continent and it would be great if US operators could do the same. If the US wants US headquarter vendors to flourish and help build our next generation networks and take advantage of open round, you know we've got to act now. Um? So from that perspective, you know we can create secure, diverse and reliable supply chains and help America lead in 5G beyond and taking actions that it's important to recognize that the fundamental parts of this disaggregated network are coming from, you know he's coming from American suppliers such as your Intel, Dell Mavenir, you know. So the DVD infrastructure is basically there. We just got to pull this together with incentives. And then you know, clearly we need to firstly explicitly prioritize open ran. You know? So unless you, unless we do this, there will be no American companies building 5G infrastructure in the US because especially at the moment everything prioritizes everything back to the same two vendors. Second year incentive incentivized deployment. You know the US government should offer certain incentives such as loan guarantees, grants, tax incentives, and demonstration sites to help propel carrier adoption. You know, we should also require companies to open their interfaces in order to receive federal support. And this is really what we're seeing in Europe now, where you know operators are opening up certain sections of their network and committing to deploy open ran technology. And the third is is the preference for US headquarter companies. And again, you know we're seeing all the investment put back into foreign technology companies where the US is seeing no benefits. So really, you know there are sort of three requests if you like in terms of private eyes, open ran, ensure incentives and then you know preference. USA quarter companies. Thanks, Travis. Thank you so much so I have a workshop coming up and then after that I see Paul's hand raise as well as 21 US Bloom and Mike from Verizon on the phone, so I'll turn it over to look again once again if you want to participate, please raise your hand. We'll make sure that you're in a queue. If you're on the phone, please shoot me an email at T Hall tha LL at Mpia dot Giovi. Thank you. Thank you Travis and thanks to NTIA for hosting this important conversation today. Samsung has made major investments in the US over the last decade and has become a global leader in five feet across a broad product portfolio that stemmed that spans network equipment. So we conductor chips, mobile devices, services and planning tools, all of that. Coming from a trusted and secure supply chain. Last September Samsung and Verizon signed A5 year \$6.6 billion strategic agreement to supply network, equipment and services for Verizon's next generation Network, and Samsung is supplying 5G network equipment and major carriers around the world, including key markets like the US, Korea, Japan, Canada, and New Zealand were also quite active in Europe, for example, with the first 5G standalone core network trial in the Czech Republic with Deutsche Telekom. We've launched 20 four 5G enabled device models globally across Samsung across smartphones, tablets and laptop PC's with many, many more to come. We've also introduced the world's first millimeter wave 5G telematics control unit for connected cars through our Harman International subsidiary. Samsung is a leader in the O Ran Alliance and a pioneer in achieving cross vendor ran interoperability. Even before the O ran, Alliance came into being. Last month, Samsung announced its latest 5G advancement with the commercial launch of RV ran 2.0, the

first fully virtualized commercial 5G ran in the US in the Verizon Commercial Network. A more open network architecture provides numerous benefits to operators. For one, it drives competition among vendors in the network. Secondly, it enables service providers with the flexibility to select best in class components for radio and baseband functions, rather than getting locked in overtime. And finally it simplifies migration from 4G to 5G by allowing a more modular upgrade path. For example, replacing baseband units while leaving legacy radio units in place for some time. Samsung is very supportive of the open Ram policy Coalition's efforts to raise awareness of the benefits of open ran standards and to promote specific legislation and policies. And we support the Coalition's position that the market should lead open Rand adoption as opposed to government mandates. Samsung knows from direct experience that open ran standards are relatively new, not yet as easy as the quote unquote plug. It plug and play that would come from, say, connecting your PC to your printer multivendor. Interoperability still takes extra time and effort. Which is of course a normal phase of technology evolution. Government should help the ecosystem accelerate the process and lower these hurdles in two ways. One support interoperability test beds and 2nd conduct pilot programs in some of its own procurements examples where NTA specifically could help, or the Wireless Innovation Fund. Authorized in last year's NBA and the NTIA DoD 5G challenge. Thanks very much for giving Samsung the opportunity to contribute to today's session. Great, thank you. If we could then move to Paul. Hi thanks Travis. Hello everybody, my name is Paul Challinor. I'm the VPN network products for Ericsson responsible for radio technology in North America and 1st. I'd like to say that Ericsson is committed to the principles of open and interoperable networking and we're proud to be a trusted vendor over the last 140 years to the US and are being a leading supplier of 5G with over 80 live networks globally. Erickson is a leader in the Open Round Alliance and We Co chair two working groups and we made actually in 2020 more contributions to our and specifications than any other company. We see open ran as having three pillars, virtualization, open interfaces and automation, so virtualization what's that? So this separation or dis aggregation of software and hardware, that means that, say, the Ericsson cloud ran software, can run on a third party independent server. So thinking like a Dell or HP and then that in turn can run on processors Intel or AMD, other other processes and tie together by a cloud infrastructure, again provided by many cloud vendors. Many of whom are American companies. Our next automation so automation is part of open ran allows operators to simplify the complex operations using cloud independent platforms, again with third party application. Allowing other entrance to come into the marketplace to improve vendor diversity and then finally open interfaces where some of those available now based on 3 GPP, some new capabilities or will become available and some have a quite a journey for maturity. So open networking is really beyond the Rand, so we have to think about much of the 5G service enablement and five G changes happen outside of the RAN as well, so 20% of wireless cap ex is spent on radio equipment. That means 80% isn't, and so there's much more to 5G vendor diversity than just Iran and many of the most powerful concepts require rely on other elements of the network, like mobile edge, computing core or OSS. So any examination of 5G vendor diversity needs to include. All network domains and today we count over 405 G ecosystem providers in the market today. So let's talk about open source for a second. So what about open source open ran does not equal open source, although many vendors will use open source elements in their implementation. Open Source has its place in the future of software equals ecosystems, and it enables broader ecosystem participation. The open round software community is the Linux Foundation Project that's run by Open Rand Alliance to allow evolution of of open source in the

open round context. So in 2021 Ericssons made more contributions to that that OSC environment than any other vendor. Then I what I would say is it's important to think about security when we talk about open ran and really the nascent state of security and open ran and lower base level requirements in open ran is really a challenge compared to Nano ran or three GPB requirements. Now this activity and this challenge has been worked on in the Security Task Group in the open around Alliance and we're implementing a security road map. Many of the recommendations are from Ericsson there. The next thing to think about is vendor diversity. As an on the supply side and that we are, as we see, market responds to the demand. An initial 5G deployments reflect actually a wide a wide number of active network vendors, and in fact in a 2021 M Dear report it shows the US has the highest number of operator partnerships with vendors than any other company country. So for example the USS 36 versus Japan's 29 versus South Korea has 26, so market share is. Represents a result of operator commercial decisions and should not be used as a measure of gender diversity and then finally US5G. Success requires rapid build out of our 5G infrastructure and establishing this platform for innovation. Much of the US innovation and economic success is underpinned by this infrastructure and likely experience with 4G, which created huge opportunities for US companies like Google and Facebook and Uber, according to recent CTI report, 5G deployments will contribute \$1.5 trillion to US GDP. And create 4.5 million jobs in the next decade. We, as a nation cannot be diverted by technology debates and cannot wait for new standards to mature. We must deploy. Now. There isn't a moment to lose. Thanks, Travis. Thank you so much and I'm going to be turning to 21 US Bloom. If you could introduce yourself also after after that intervention, we do still have some time and some space for a few more folks to chime in on this particular topic, so we'd love to have your participation again if you are participating bayati. Evelyn, has we seem to have lost Travis. Should I go ahead? Hi. Natural hair something thank you. Geoff Blum. With Dish Network to US Open ran is really about competition and innovation and dishes in the process of building out in the United States. The first 100% five G standalone fully O Ran Alliance compliant virtualized cloud native automated network and we're really excited about it for the first time in this country. For decades, we're using American vendors. We've selected. Mavenir, an audio star to do the Ram software where getting our radios from Fujitsu and MTI Nokia is providing our core VM Ware is providing sort of the cloud. We have partnerships with Intel and Qualcomm and that competition we think is extremely positive because the goal is really to build out a network that's cheaper, faster and better than legacy networks and we've been working on this project for years. The standards are ready. Technology is ready. We believe Ohran networks will be more secure than legacy networks be cause a lot of the brains will be in the cloud and it will shine a light across the network at a very granular level that will make detecting intrusions easier and being able to isolate it. We believe the networks will be more resilient not only from the supply chain side of it, but the network itself because of automation, and I think you know what has happened in the past. 18 months as a reflection of the significant industry momentum in bracing open ran the fact that Congress passed the NTIA Grant program last year. The leadership that the FCC is shown on it. We're very pleased that Chairwoman Rosen Wersal circulated the 5G NY yesterday and looking forward to participating in that, but I think it's it's very important for Congress to fully fund the open Rand Grant program, NTIA. I think you're going to. Get a lot of grant proposals and a lot of the small American vendors have so much to gain about being able to scale up hiring software engineers and speeding up the development of open ran on building manufacturing facilities here in the United States. So we're really encouraged on the progress. There's more that needs to be done, but having sessions like this and sharing information collaborating, I think is



the best way to have the US lead. In this technology 'cause it's it's so important. Thank you. Travis, do we have it back? I'm sorry I forgot to mute myself. I actually blinked out for a minute and now and then protect myself if we could get Mike from Verizon on the phone. Mike, can you play Star six time yourself? OK, can you hear me Travis? I can hear you fine, great thank you. OK, perfect thank you. Once again. My name is Mike Kendrick. I'm a director at Verizon and I want to thank you for the opportunity to speak today. Before I begin, I want to be clear that I'm speaking on behalf of Verizon. Verizon is lead over in development for leadership roles and participation in multiple working groups in the Open Alliance. We are also a founding member of the Open RAN Policy Coalition. Verizon supports open RAN and is working toward the eventual incorporation of Open RAN solutions into its network. We also understand that the move to Open RAN is a journey and there's work to be done to ensure seamless interoperability while minimizing operational complexity before solutions are implemented at scale. In order to facilitate the development of open RAN, Verizon supports programs like those created by the US Telecom Act that establishes a wireless Innovate innovation Fund. To help with R&D and trials to build up open RAN capabilities and support new entrants offering open RAN solutions. However, we believe industry should continue to lead the development of standards and specifications for open RAN and we do not support any rules that would require operators to deploy open RAN. Decisions on deployment of new network technology are based on a number of complex technical and business factors unique to each operator. Standardized interfaces have always enabled in proper ability and the potential to scale to ecosystems. Evolution towards open interfaces further drives innovative opportunities there. An hardware and software components solutions can enhance various aspects up and down the RAN functions and stack, lowering the barrier to entry. For innovation in the space open RAN architecture can create greater competition, innovation and supplier diversity in there and supplier base. Those benefits serve as a strong incentive for operators to move toward open RAN, and Verizon is leaning in to help solve the technical opportunities with these standardized interface is an example of Verizon's leadership and execution in the space include this commercial Verizon launch including VDU and VCU functions deployment deployed on common off the shelf hardware. Our Verizon efforts work in parallel to the over in efforts, although technically they are, there are two different paths with some. Overlap, for instance, VRAN provides flexibility in terms of deploying scale and management of the network all over and allows for the potential to combine different vendors as we evolve the right side of the network, it makes sense to combine the efforts as much as possible while one disaggregate the hard. Where from the software the other standardizes the connections? Although one may be ahead of the other in terms of maturity, directionally it makes sense to combine them as much as possible from a longer term perspective, virtualization of the RAN functions allows for an environment where we can utilize the best in class software across common infrastructure. We expect such disaggregation also helps enable greater innovation in the space as well. One of the biggest challenges in the virtualization environment is the integration piece. Where is more focus and responsibility is on the operator to ensure the integration across multiple partners meets our requirement requirements and performance. Extensive testing is a must, as is the tight collaboration with our vendors to integrate the functions. Right now Verizon is is playing a larger role on the integration side when it comes to matching the open RAN transition. However, we expect processes to mature overtime and vendor community could also provide solutions to minimize operator burden. But the ecosystem continues to develop with respect to Open RAN. Verizon continues to lean in and move it forward while taking a pragmatic approach. This is a journey we are on and we are looking

forward to the realization of opportunities promised. Bio ran in time. Thank you. Thank you so much. Let's go ahead and move on to Liam. When you should be able to meet yourself, OK, I can unmute myself now. Thank you very much. So I'm Liam Madden from Xilinx. You may wonder why you're talking to a chip person. Turns out that you know US semiconductor companies provide much of the chip technology that drives 5G systems. An an, as you know, recently we saw some significant impact based on government decisions, which we agree with, but which nonetheless can have a significant impact on our business. And based on that we would like the opportunity to be able to sell. Our product to a range of manufacturers, particularly those based in the US. So if we look at it, you know there's a comment about you know government not being involved. Unfortunately, in the current world that we live in, government has to be involved in these types of decisions. You know, if we went with the concept that this is very difficult and you know the existing companies have the only way of doing it, we'd all still be buying computer systems from IBM and they would own the entire thing. So I think we have to recognize. That there is a shift in the industry and it needs to be supported. Unfortunately today as the Mavenir representative said, US companies have had very limited participation at particularly in the area of radio and hardware design, and we fully support the open standards that are coming out. We think that gives a diversity of opportunity, but from the other perspective, I think from a commercial point of view speaking, you know, as a US citizen, I would like to see some of that commercial advantage come. To the US in GDP, particularly in GDP that we've lost as a result of some of the recent trade imbalance. And the other thing is national security. As a country, we can't afford to be in a position where we don't have the leading edge technology. Know how, as I said, from a semiconductor point, if you are in an extremely strong position, but from a systems point of view or not, and that's a fundamental issue, so our position is that to facilitate an indigenous system design capability really, we need help from the government of bootstrap this activity. It's wonderful to have the idea of you know, platforms and efforts to try things out, but in the end I think time is not on our side and so as a result I think there is an opportunity for the government to get involved in providing some incentives an I believe that the open Rand is the ideal and mechanism for making this happen. Thanks very much. But thank you so much, Liam. Let's go to 21 Miss Boyer. If you could introduce yourself. Chris Boyer hey, sorry my, I'm still I was on a an event the other day with a pack and some still listed as 21 which is my personal number there. Chris Boyer from 18 T just wanted to pick up the theme that Verizon was talking about a few minutes ago. I think you know on the issue of US operators and deployed open ran at scale and we had a little bit of discussion about this and the listening session last month, but ATT is very active and the Orion space were one of the five companies that was the original founders of the Orion Alliance, which as John Baker talked about is is working on specifications for Openwrt and Orpha. Roran were also one of the founders of own app which was working on the same issues back in the core of the network, so we've been heavily involved in that. We've been going through several different trials in different projects with several of the suppliers that are here on the phone. Are in the meeting today. I think the issue of you know of specific vendors that we've chosen today I think is Verizon spoke about it. It's a complex issue, you know. We have a very complex networking environment with a lot of feature sets that we have to support for a wide range of customers, including enterprise, business, customers and so achieving feature parity and driving and making those decisions as a complex issue. And so I feel like it's just it's just a matter of time before we introduced open ran technology into our solutions and architecture into our network, but. There's still some issues that have to be sorted out, and we're doing a lot of work to do that so. I think it

would be inappropriate to mandate a solution. I agree with Verizon on that point. That's also the position of the open ran policy Coalition because I think folks recognize some of the complexity there, but I do feel confident that overtime those issues will get resolved. And as I said, we are actively pushing in this direction, for we've been doing this for quite a long time and really looking forward to this technology and moving forward. Wait, I'm gonna give some housekeeping notes one more time and get folks one last chance to weigh in on this initial topic. If anyone would like to weigh in, please feel free to raise your hand or shoot me an email at T Hall tha LL at N tia.gov. And again this session is is public. It is being recorded and we are going to be posting it to our website so if anyone would like to weigh in on this last topic. Comma I will or respond to any of the things that have been said so far. Now is your opportunity, and if not, um. I will go ahead and turn it over to our director of ITS Cheryl Ginkgo. Travis chalet please go ahead. Good morning everyone. My name is Doctor Cheryl Genco and I'm the director for the Institute of Tele Communication Sciences. We are the nation spectrum and communications lab located in beautiful Colorado where we have about 18 inches of snow this morning. So the title of this section is is making open and interoperable networks of reality R&D testing. Another domestic efforts. Well, that's exactly the intersection of research and development. There's usually something in between. Which I term applied research and that's definitely where my laboratory sits in this very applied place now. Right now, we're going to talk about some opportunities and challenges that open and interoperable networks present and will turn to some of the efforts to deploy those networks here in the United States. And Kay is working to investigate ways to accelerate the research and development and deployment of open interface standards based and interoperable 5G networks across the nation. Here in Boulder, even with the snow, we've been building out an LTE and five G laboratory to support cooperative research and fill it with industry and other government laboratories. ANAN federal agencies. Specifically, I TS the Nation Spectrum Communications lab is building out our 5G test lab for the first year. The focus will range on a number of initiatives, including testing the feasibility of integrating ohran based 5G base stations. Specifically looking to better understand the complexity and challenges of integrating equipment and software from multiple vendors. In addition to focusing on Orion integration, will test interoperability and handover between Orem, Gino Bees, as well as orand based. You know bees in traditional 5G ran, Gino bees, lots of work to be done for ITS. In addition, there's an intersection of the Rand virtualization and the Iran to specifically evaluate what can and cannot be achieved. These capabilities are often confused, but will you see quite a bit of overlap? Anne, with benefits of both ran and virtualized, ran finally. NTI, a software building materials, is a demonstration of the value improving our supplies. Chains will also be investigated. Some of the folks on this panel earlier today, specifically John Baker and Alex Shaw from Samsung, mentioned the 5G challenge that we are working with. The Department of Defense on this 5G challenge again is is the open. 5G software stack. OK, we're very careful to to describe it in that way for specific reasons, right? As you all are very, very well aware an. I heard it today. I believe from John Baker this idea of demonstration sites. Well, all of the responses to that Noid are posted on NT's website and we are now analyzing them for the formation of the challenge. I I tell you that one of the key pieces that it is heard over and over and over again in the 350 pages of responses is this idea of ITS or or the government setting up a demonstration site. And so thank you. Shout out to John for that. That statement an to Samsung. For you know mentioning the 5G challenge with those 3 / 350 pages of responses I want to reach out to those of you on the call who may have responded very detailed, excellent, well thought out responses and an NTIA. Thanks you very much for your time. I can assure you that this

challenge will be a shining example of what we call the whole of nation approach and a collaborative philosophy. I'm bringing that philosophy into I TS. The nation Spectrum communications lab. Because this 5G challenge 5G REMC work, all the work that I TS does. It takes the whole of nation right? Everything is is too complicated to sit in your in one's office and just rely on one researcher. So just to one other point, as we are rolling out the challenge, we will have communications. Please keep in touch or or or look for our press releases, whatnot. Part of it will definitely be to hold us to convene some sort of stakeholder Council an we appreciate peoples volunteering to beyond that stakeholder council. So, but getting to making open and interoperable interoperable networks reality will require continued and close collaboration with industry and. NTIA and I in particular will look forward to hearing from all of you. Thank you for your time. An Travis. It's it's up to you right now. Great and I believe we have some Jonathan Doyle from the Atlantic Council. Do we have you on the line? Great. I could. Good morning, I think this, uh, this whole panel is really excellent. It's fantastic that NTIA is moving so aggressively to coordinate across industry there is, you know, so much opportunity to bring together. You know all of these organizations, which is really a very complex picture, because this problem has sort of changed and evolved so much from 3G and 4G. So from our perspective, I think NTIA is sort of aggressive move here too. Have this conversation is really crucial and you know our hope is is that this conversation will continue and maybe it would be worthwhile to make these events you know, sort of a continuous activity into sort of 2022. I'm sure the legislative branch is kind of, you know, look at a number of these different issues from various perspectives. Atlantic council. We've been thinking a lot about these challenges from a geopolitical perspective, and in so much as trying to figure out how to affectively compete against, you know. Sort of a nation who is tying finance effectively together with, you know, excellent technology. The participation of all the entities on this call really drive. You know, the picture that we believe is really critical for sort of the global safety and security of telecommunications. And really, the expansion of, you know the use cases that will come later on. One other sort of component of this to the point about R&D that we think is critical would be. The support and appropriations for the public market. Supply Chain Info Fund, which we think could really be available, be made available for a number of vendors here to make smart investments and in supporting various components of this ecosystem going beyond even open. Ran to looking at use cases and some of these other challenges that are going to need to come together in order to make the economics of 5G worthwhile and certainly to support emerging markets nations as they go and try and solve some of their connectivity challenges so. Again, thank you so much for NTIA, for your continued leadership. It's been great to participate with on these calls and to be able to look at this problem. You know, in the multifaceted way that we think it needs to be looked at. Thank you. Great, thank you very much. I don't actually have currently any hands raised, so let me do a little bit of prompting. For that, we are absolutely interested in Inbox in interventions. Right now we are talking about what we can do in terms of domestic developments in order to achieve the goals of vendor diversity. And we heard already a lot about Orand. We heard some folks talking about how it is actively being deployed. We've heard some folks talking about how there are still quite a bit of work that needs to be done. We have, of course our test testing facilities being set up. There are grants and money being made available for research and development on the applied side on the development side of what do we need to do in order to not just for oh ran to make that a reality, but also open open source open virtualization. All the different technologies. I know that all of you have lots of thoughts and I would love to hear them and to get the conversation going so we do have John Baker let me

turn to you others. Please go ahead and raise your hand or send me an email if you're on the phone. Thank you. John will make your presenter and you're good to go. Yeah, thanks Travis, you want one point in terms of diversification, supply chain, and you know, marriage is an auto star of sort of taking this as a very critical issue is supply of radios. The whole supply of radios is coming from outside of the US back to the point earlier from Xilinx that you know a lot of the skills of remote Radiohead manufacturing and design. Actually started in the US many years ago and then moved offshore to China and Taiwan etc. So in reality there's very little radio R&D from a manufacturing and final product perspective done in the US, and so you know this is a critical issue that does need addressing. And certainly you know having an auto star and some other companies are taking an aggressive roll tip Facebook through the even start program and the first evenstar radios have been launched to the marketplace. But. Given the numbers of frequency bands that are needed and types of products that are needed, it's going to take awhile to fill. You know, the complete requirements for the carriers need so you know certainly had raised that as a as a red flag and something that needs to be addressed in the industries is how to localize radio design, manufacturing and test. Great, thank you so much Alex. Hi good morning everyone. Thank you Travis for the opportunity. Thank you John for your presentation another another presenter it was. It was a great so I'm located in Canada and representing the working for the Government of Canada and we are very eager to hear what's going. What's going on in the in the US in this field as we understand that the world is moving very very very fast in some parts of the world. In fact, our probably probably ahead ahead of us. So very eager to hear what's going on in the US as we're looking for whatever it thinks we can. We can apply in Canada in terms of the. Presentation about itsa labs. I think that we would like to follow up with with with you Travis and and with Cheryl Becausw. We have also thinking a certain things to developing in Canada and we believe that if we can exchange what you plan to do and what we plan to do, we can use the synergy from the both sides because we really had one very hot topic from. Providing testing feasibility for integration related to open run which which we have which we have also big interest. So I'll be glad to follow up. My messages. Will be glad to follow up with with you if you can have a separate section. Discuss those up those opportunities for information exchange and collaboration. Awesome, thank you so much and we're looking forward to that. Enter bond. Go ahead and then you are made a presenter. You can unmute yourself. Hi, I think there's an excellent comment from both filings and John Baker from Ave regarding the incentives to help some homegrown's capability and I'm coming from Global Foundries. There is the very bottom of the food chain right ecosystem starts from foundry. Go all the way to the system, software stacks and ultimately to the system. So I think the incentives has to be there to make sure that we have US drone manufacturers for the technology and talk about hardware technology point of view. There of course, it ultimately go to the Chiefs packaging systems module, software sticks and others, so it's very important that we talk about the whole ecosystem, not just part of it. Yes, we basically believe in open standard, but at the same time equaling the concern of a T&T, and Verizon. Doesn't matter which way we can proliferate five. You should do that, but yes, ultimately the scaling will come from the flexibility come from open red, but the point I'm trying to make here is the incentivising the whole ecosystem here. That will basically help expedite this development in the on the US, So thank you. Hang on for one second. We're getting Travis back. Um but. I understand thank you very much for your comments. I need azita. I am going to make you a presenter so you'll be able to unmute yourself so we can hear from rocket and. You're still, it looks like you're still muted. Can you hit the can you unmute yourself from your side? Yes. Perfect thank you. Yes, Catherine, thank you very

much. I'm a ztar Bonnie. I'm general manager of Rocket and mobile Americas. If I may. I also wanted to share some slides because it helps with. So if I can. OK. Yes, honey, now if you can see the slides. Can you see this link and see them yes. Very well, thank you. So I wanted to first take this opportunity to thank the NTIA to have this listening session. It really helps to hear from what NTIA is thinking about, open run, but also from different companies and colleagues who are paving the path to leadership for global 5G ecosystem. So obviously we have been in this open run an also virtualization. For mobile networks for more than two years now and I won't go over all that, the things that we have done but just to remind people that back in April of 2020 we came out with a full scale commercial launch of the 1st and still the only end to end virtualized open run. And totally cloud native network. And then he followed it in September of last year with five. She launch and we are seeing great results for the technologies that were using so far. So we want I wanted to mention that the innovative at four strategic levels. That's very very important. Number one, these disaggregated the Radio Ann as our CTO would like to call it be mystified their radio. And it's really happened at multiple levels. One is the of course the the Open run model of. Taking in and breaking it into three layers and an having open and interoperable in their faces with induced layers, the separation between hardware and software and being able to run the software on top of commercial off the shelf hardware, which is much different. Lower price point. And also even going deeper into the radio unit itself and looking at the components at the chips and all of that and how they interact with each other and then putting it back together so that this this aggregation really has happened at three different layers and that helps a lot with understanding your supply chain and making sure that it's secure. With the Unified Cloud, we have created a cloud that's not just elastic and the using the latest cloud native technologies of microservices and containers, but it also handles telco cloud as we all know, radio workloads need very very low latency, so it's not just did you run it just at another IT application on top of a cloud. The cloud native architecture that we're using has helped us with massive automation, and that has drastically reduced the times that we have to. For example, bringing up a cell site like provisioning itself that for us and forgery takes only 8 1/2 minutes and in 5G only four minutes. And that's only possible using massive automation. That cloud native architecture has enabled us to do an overtime, you apply more and more machine learning and. AI to our. To our processes and makes it even more efficient. And helps us reduce our our operations costs when it comes to the organization. It's also very important to realize that you have to have the right skill set and it's not just a Telco skill set, but it has to be married with cloud and software skill set and have a very agile and platform thinking on that so. In terms of the supply chain, I wanted to bring that notion home that a lot of the things that we use in our. In our network or have the US tech DNA and we're hoping that that the help from the US government you can actually. Help with their growing this ecosystem. So if you look at our radio technologies even though our for example the radio that's shown in here, it's our sub six 5G radio massive MIMO. It comes from NEC but we help them design it and we know all the components that are going in there so we actually know all these components vary. In detail, and so we know that the entire supply chain is very secure. Same thing that the cloud technologies we you know you see you see here. There is majority of that comes from the US companies. An networking as you see it's 100% US technology so just. In terms of security, it helps a lot that be understand our supply chain down to the component level and beyond that. So we start with a trusted set of. Partners, but we have implemented the zero trust posture so we continually dynamically make sure that things stay trusted in the network were following in this framework, and we've also been designated as a 5G clean telecommunication company, but by US State Department. So that's

to say that there was a comment that the open networks cannot be as secure as a matter of fact. Open networks. Allow you. To put more visibility and more control points in your network, so to make it actually more secure. So we believe that you can have a network that is fully secure, fully agile and fully affordable in terms of reducing the cap ex and reboots in the op ex. So what the government can do is to help with a fun. For example for companies to build reference designs. Or is a radio units for open on that has secure supply chain in it and then various vendors can can? Wait on top of that, that's just one way that we see that this can work, and at the same time we also want to put a plug in for the fact that we have here acting communications platform that helps operators that want to take the similar journey as we have taken it. Cloud, native and open run and virtual run. Automated network that helps them with like the very secure supply chain. And thank you very much. Thank you and again if you are interested in participating, please raise your hand. If you're on the phone, shoot me an email at P Hall tha LL at NTIA dot Giovi and I apologize that I break out every so often. I don't have the 5G quite yet. Enroll walking from where I'm currently at, so thanks everybody for patients with that, let me turn to Brian Hendricks. Go ahead. Um, can you hear me? I can travel. Yes OK, great thanks, we participated in in the last listening session as a presenter. So I don't want to take a lot of time away from other people, but I did want to arrest. Onto a couple points and then and then talk a little bit about we can call him whatever you want. Innovation beds, test beds. There's a sensitivity to calling him test beds, and I'm I'm attuned to that. The first thing is I want to talk about a suggestion that that we're hearing a little bit more frequently lately, and that is around. Governments playing a role in encouraging operators to make commitments to to adopting a particular architecture. You heard from two large customers already on here today. Why would be extremely complicated environments that they have with huge reliability an world class capability? They haven't seen the things they want to see yet, and I think we need to pay attention to that. It doesn't mean those things don't exist or can't exist. It means when we design innovation beds or. Environments to to demonstrate it should be with an eye towards easing the anxieties. Ann and showing the in showcasing the capabilities that those operators want to see, not forcing them to make a commitment in time. An adoption of a particular architecture. Second suggestion that was made that I think NTI in particular in the Commerce Department have to be very wary of is the idea of establishing preferences based on where a company or a vendor is headquartered at a time. Where where we are engaged globally in an effort to ensure other countries do not adopt innovation, Indigenous innovation agendas and we have for many years Nokia has supported US efforts to prevent India and other countries from going down that Rd. It would be extremely damaging to US credibility on that point. To to start establishing preferences for vendors. Incentives are different than preferences, so let's avoid that at all costs. And now turning real quick to the question about innovation beds and one of the things that we've suggested to Chairwoman Rosa Morsel and we've suggested to the Commerce Department and some of our discussions is work backward. From the comments that the operators are making about the questions that remain for them about integration challenges an costs. An performance and feature parity and security, all of which we think can be addressed in open ran and set up emulated in network environments that approximate the deployments that will be experienced out there. Provide an opportunity for the some 100 and six 210 different profiles that have already been created through study group. Four of the O ran Alliance working Group for for the for the specs and start showcasing that you can actually combine vendors and do so with high performance and do so with high security and demonstrate some of what would be involved in the integration challenge. The Commission can issue S Tas. To make sure that all the relevant

bands that are deployed are studied so there's a great opportunity with the money that the Commerce Department will get soon, hopefully from Congress to establish both basic foundational research activities, but also create this opportunity. But again, the idea here isn't proving that something works, it's addressing the anxieties that seem to continue to exist out there about open ran and show what it's capable of doing an learn as we go with real time feedback to all the vendors who are developing these solutions so. We're looking forward to that conversation. Don't want it to be misunderstood as testing. It's more about demonstrating against real world deployment scenarios. Ann and completing the interoperability testing within other small walled garden and partnerships. But among all vendors who are developing or ants solutions. So I just want to make those comments. So thank you. Thank you very much. Again, we've got a. We do have a little bit of time left in this session to discuss research and development, testing or innovation, as the case may be. And also let me just put out there. We've been talking a lot about Orion. We haven't really had a lot of conversation on some of the other technologies that could potentially be used in this space. Virtualization open source would love to hear some thoughts about, uh, about those other technologies about what is needed domestically to really get us to where we want to be. We've also heard some really good comments so far, some on various sides. Of different issues. You know how these things tend to go is that they are, you know where. We all are polite and professional, but there are some disagreements that are surfacing. If anyone wants to respond to any of the comments that have been made so far. Even if you spoken already, we welcome your interventions. So if you have some comments, please feel free, raise your hand. And if you are on the phone, please shoot me an email T Hall tha LL at. Ntia.gov and let me put it out there again. Does anyone have anything that they would like to intervene on on what needs to happen and it doesn't need to necessarily just be straight up what needs to happen in order to make ohran possible. We could be talking about some of the cyber security aspects of gender diversity and domestically. What needs to happen there. So if anyone has any comments that they would like to make on some of the on any of the aspects surrounding vendor diversity domestically. Um, please raise your hand and we are going to be then moving on shortly to a conversation about what needs to happen internationally, what the US government can do in terms of its diplomatic efforts in order to ensure that we are in lock step with our partners internationally, making sure that we are pursuing the goal of gender diversity so. Once again, I feel a little bit like a telemarketer here. Anyone who would like to raise their hands, please go ahead. And I actually have. I have a couple of people who have taken me up on that offer, so let's go ahead. And if we could get Rochelle to to speak. Great, can you hear me? Yes, thank you OK perfect. So I'm Rochelle seller easy. I am a director of government relations at VMware. We are a leading provider of the digital infrastructure from cloud infrastructure to digital workspace technologies that serves as the foundation of application services and experiences that empower our daily lives. From our founding in Palo Alto over 20 years ago when VMware launched our pioneering software that allowed customers to consolidate their data centers into fewer physical devices virtualization. VMware has been committed to delivering innovative technology that allows us to realize what's possible. And as we've noted today in the Open ran 5G space VM Ware is currently partnering with Dish to make that a reality here in the United States and bring that to our homes and one of the things that I really just wanted to urge us to think about. An just reiterate is that we support the calls for full funding of the USA Telecom Act, and really. Putting that in market incentive out there to bring this to the to the US and one of the things we haven't really talked about is just what that impact can be. And so I want us to remind ourselves that there are 41 million



Americans today that lack high speed Internet access, and we're really seeing the impacts of what that lack of access are today during the coronavirus pandemic. You know, we are increasingly leaning on Tele work, Tele health Tele meetings. It is so important that we are investing in that technology and bringing the full. A force of that along to to all Americans, to make that something that we can participate in our society fully. So I just wanted to urge us to think about that. And to you know again, add our support to full funding of this R&D and really stop talking about it again or not really focused as test beds we need to, you know we have the technology here. We're partnering with Dish Europe is already working on this as Rakuten just also presented this. Is this technology that's already going in. Japan, so it's not testbed technology really. It's really about implementation and getting that funding out there to make this a reality. The last point I think we're going to talk about this a little bit more in the next session, but I would just like to highlight that you know other countries are also starting to think about this and take this very seriously. We just saw the German government put €2 billion into a similar funding, so that's something to for us to be considering. So again, thanks for having this session and VM Ware is very excited to be part of this. Conversation in this solution. Thank you so much, Danielle. Daniel, you should be able to meet yourself, sorry. I think I'm visible. Yes, sorry. I am too many video conference applications. I forget world buttons are Daniel Chris with Palo Alto networks. I wanted to pick up on. Travis is your remark about hitting on some of the cyber security expert aspects of open ran. So Palo Alto networks. Is the world's largest cyber security company. We do. We do not make the components in the rain, but we do secure the entire of 5G infrastructure. Including in the Rand or or open ran or or. However, that's aggregated so you know, like there's been a number of discussions about the importance of security in open ran an wanted to highlight that you know lot of companies in the ecosystem are really committed to that. We know the US government is very interested in security in the opener. And so as you think about some of the policy levers. You know we're not talking about mandates here, but, um, encouragement. You know there has to be a focus on securing open RAM. There's various ways that can be done through securing the network. Slice is promoting cloud security, promoting a zero trust approach, but we really need to remember to integrate cybersecurity into what we're doing, because, you know, that's just going to be a senchal for 5G networks in the future to be secure. That's it, great thank you so much Liam. Great, thanks very much again, um. So yeah, basically one of the things I did want to talk about is I like to go by analogies and where things worked before and I think one of the things that we tend to look at. I come from a history actually in the processor business, but if you look at what happened in data center around this aggregation, you know I really would like to echo what VM Ware is talking about. The whole concept of virtualization and the ability to innovate at that level I think is really critical and I think when we solve. What happened within those networks? I think we saw what was a very closed and and integrated network open up and as a result we saw a massive amount of innovation. So again, when we look at these things they are very difficult to get going and but on the other hand, when they do, they usually result in significant advances and it's not just in terms of cost but you know also in terms of aspects of security that I think we're having. For example, you know an open community. I'm in a situation where each person can contribute is a huge plus in terms of moving things forward. Thank you so much I'll let's turn it back to Azeda. Hi thank you. I'm as he dug from rocket and mobile. A couple of points as as my colleagues were discussing one is, you know if you really want to have leadership in mobile networks for the USI think we should start from the vision. You know where do we want to be in five years? Where do we want to be in 10 years? In 15 years, 20 years, etc. I think it's always harder if you start. From

where you are and thinking, OK, you know there's this big mountain that I have to climb and if I take an analogy, if I want to get in shape if I just think about all the things I have to do to change my diet exercise, you know it just feels like. Getting out of my comfort zone is so much harder. Rather than think about what's my vision of what, what this in shape look like, and how do I get from here to there and keeping that vision and being committed to that vision then pulls you forward. If you just think about oh, what are all the problems? Problems with, open right then then it. It makes it more difficult to move forward. Instead, if you think OK at some point we have to have open Randy have to have secured supply chain and what can we do to get there faster right? So and is this really a technology issue or is this are stepping out of our comfort zone? We believe that there's. At this point a lot of the technology issues have been solved and then the remaining ones are not something that we collectively cannot solve. If we put our minds together. If you just keep find looking for issues, of course there will be issues. So I think that you know working on USA Telecom actually making sure that it's funded enough. Looking at our vision for leadership and then having all these other things like the five G challenge and all you know helping with their supply chain. Those are all. Enable us to get getting tar vision. I really like what Rachel from VM Ware said about this is no longer a testbed, right? We're not just testing things anymore, it is a reality. We're showing it. We have 5G networks with download speeds of 1.77 gigabytes per second. I mean, it's happening now is not interested. We have subscribers, we have phones. We have, you know. And uh, and so any this is very secure network. It's working and I understand that every operator is infrastructure is different, so obviously they have to have things made. You know, customize and issues resolved for for those networks, and that's that's a valid point. But again, if he commit to something then we need to move forward on that. And if just realizing that, for example with this rip and replace, if you put in legacy. Equipment in there. They're going to stay there for the next 10-15 twenty years, so whatever steps we're taking today, it's gonna have ramification for decades to come. So that's something that we really need to take seriously about every piece of equipment that goes into anybody's network right now to see if it helps our vision or it takes away from our vision. Thank you. Thank you so much. Let's go to pool. Yeah, thanks Travis. So I wanted to just pick up a couple of points. One is on the manufacturing side and I just wanted to bring everyone's attention so Ericsson made \$100,000,000 investment in a 5G factory plant in Lewisville, TX and actually it's been a great experience for us because not only does it give manufacturing capability in the US and bring EM bring jobs, but it's also allowed us to use 5G to build 5G and so some of the use cases of 5G is really enabling that manufacturing segment and making it more efficient for US manufacturers and so now we have. It's pretty cool environment where you have fact that you have. Robotic devices unloading components from the inbound freight take into the production line, building it, testing it, and shipping it out. So it's actually a very cold environment, but I think economically it's important because it can help stimulate manufacturing in the US and then also it's also proving out the use cases on 5G as well. That's one point. The second point is on Silicon, so we have a design center in Austin and so the importance of Silicon in radio. So some of the capabilities will be in the cloud and on cost and commercial Silicon. But customize Silicon gives you the extra performance in radio networks, and as we deal with gigabytes and gigabits across multiple frequency bands that know some of that Silicon capability is really important in state of the art networks. So I think it's also important to have that design capability in the US as well. And then maybe just picking up on the virtualization point. So we think you know Ericsson Blaze and virtualization userkey thing. It will take. It will be a key part of networks of the future. The Ericsson cloud ran portfolio, which is the virtualization and virtualization solution is being is

being deployed. It's a really important capability. One of the things I would say is that it's a journey for virtualization. So if you look at a lower data rate, lower capacity systems moving up to five G systems with all the latest mid band at the FCC release mean that's a capacity. And performance Continuum that we can moving along and so the industry is working together to kind of work on that performance as much as possible. And then finally, just as we do that as we bring things to the cloud as we open these interfaces, the work that our underlying security task Group is is really critical because security and open round is not just to stick this big brain somewhere and it will check out. And all the all the security issues in the network. It has to be built in. It has to be built in a more fundamental level so each of the links are protected and as you connect different devices in different parts of the network. Each of those connections have to be done in a secure way to have a trust stack or a trust anchor, so certainly not a overlay thing and I can't. Security can't be an afterthought, it has to be built in into the very fabric of the of the open round implementations, so I think that's an important so the security task group in our alliances is an important Ave for that. OK, back to you Travis, thanks great thank you so much. I'm gonna go to delete and then we're going to go to Edward D's on the phone. Thanks Travis, a couple of points first, I just wanted to amplify a little bit. The distinction between, you know, open, ran and open source, which sometimes gets confused in reading the 5G challenge request for comments, and you know that was something it was a little confusing at times whether they were focused on open interfaces or an open source code in the stack and reading the comments, I see that several people were, you know, raising that issue of confusion. So you know one thing I've observed is that you know, yes, the government should be in encouraging open source as a part of this. But I think the primary focus should really be on, you know, the open interfaces piece, because even if you have open source solutions, you're going to have a need to put everything else that comes on top of that. I mean, the analogy is when Linux was first came out and became a thing, there was still lots and lots of room for a company like Red Hat and others to offer all of the. Enterprise level assurance and quality. And you know those kinds of things that go on top of an open source foundation. So I think the government shouldn't get focused too narrowly on open source when you're still going to need all of all of that other stuff that comes on top of it. I thought I heard Cheryl sort of clarify that she was talking about an open source stack today, but I will. Isn't exactly clear about what she said, so I just think that area of confusion needs to be elucidated. The second point is that you know just the global point. We're seeing lots and lots of activity suddenly from the US government in the past month or two months, which is natural at, you know, new administration and some of this work. Of course started from the law last year that was passed in Congress, but just sort of the importance of having all of the US government agencies stay coordinated and kind of stay together because. There's a lot of work coming at us from different agencies in different you know forums right now to try and keep all of this stuff on track. So just a request to all of the USG participants to try and stay coordinated with each other. I think that would help us all, thanks. Great thank you and we do have a number of our interagency partners on the line today and we absolutely hear that point. Let's go ahead an Edward if you could please unmute yourself, hit Star 6 and we should be able to. We should be able to hear you. Good morning, can you hear me? We can't thank you. Great thanks, so thanks for that. I'm here today. I appreciate all the discussions happening in perspective being shared. It's good to hear from a lot of folks and partners. We're working with the topic here around the research and development needs. I just wanted to take a minute to broaden the scope of a little bit to think about 5G and its evolution and what we're really trying to solve is not necessarily just deploying the technology, but what that technology is

going to be used for. So along those lines, you know we're very focused on enabling the capabilities and the performance that's required to do that. There's a few industry groups that were involved in that I wanted to, you know, create some broad awareness on that are looking at the evolution of 5G and the applications that need to be developed for that. So it goes to the fundamental need about where research needs to be done and how all these suppliers and partners in this discussion today. Have a role in helping us get there so one to bring up is the Addison XG Alliance, where a founding member of that there's several dozen founding members actually, and that's a group that intends to develop a road map for beyond 5G and evolution of five G and these are things that we need everyone to be looking out from a multiyear standpoint. To really look at, you know what's required to drive the technology forward, and I bring this up because it's. Very crucial to look at not only what the technology needs to do today to live up to the phase one and phase two 5G requirements, But what comes in the next few releases from 3GP, P and evolution of open standards to support those requirements as well. So that's one aspect of it. The other one I want to bring up with the mitre Open Ingenuity Program, which is also looking at. Vehicles and ecosystems that can lead to US adoption of 5G technologies. That space is specifically targeting the drone ecosystem. An unmanned aerial vehicles, so I think that's one that's more near term and the US has an opportunity to drive some advantages there because of the leadership of a lot of the partners in that group. So from that perspective, just want to make sure we're thinking broadly about what we need to do in a multi or view. To drive the technology forward as it evolves. So thanks for the time today. Great, thank you so much and let's turn to Jack and then we will move on to our next session. Jack, go ahead. I get to have the last word. Thank you Travis. I appreciate that this is Jack Nashelsky from Qualcomm. I want to go back to a question that you asked. I think it's a kick off this. This part of the meeting you asked what about virtualization and open source versus over Anan. I might be stating the obvious here, but I think when. People are talking about it over, and there's sort of this fundamental base assumption that virtualization, an open source, are necessary to make ohren happen. An if you look at the over an alliance that actually have working groups on specifically on these topics. The hardware and software architecture is coming out of Ohren are designed to support virtualized deployments. There's a lot of open source projects both within Orion and outside of the Grand Alliance that had been started already. For example, the Rand Intelligent Controller has a lot of projects. It will be interesting to see which of these succeed in the end, but. The point I'm trying to make is that. When you heard people earlier just mentioning over an open ran D ran. Even Cloud ran sometimes you know the virtualization and an open source aspects are sort of an assumption, you know so so. It's hard to tease apart and separate them, sometimes because it's it's such a basic. Part of the solution. Great thank you, thank you for that and for that for that helpful correction. And you didn't get the last word on this session. We're now going to be turning our sites to the international component, and with that, let me turn it over to Jay Scherick. Thank you Travis. My name is Jason Rae Ann. I'm the associate administrator for international affairs at NTIA. Another key component of promoting gender diversity and open by design networks is working collaboratively with international partners, which is our third and final discussion topic for today. I'll also note that we are pleased that representatives from around the world have also joined in the listening session. The Department of Commerce another US agencies are collaborating with like minded countries on policy options to advance the development and deployment of open interface standards based interoperable 5G networks as a means to create innovation, spur competition, and expand the 5G supply chain. In line with this vision, the United States has been working hand in hand with the UK in its efforts to launch a set

of high level principles as a part of its G7 presidency. These principles would promote international collaboration on the diversification of the telecom supply chain and help create a long term vision of a more open, diverse and secure market. We applaud the UK's leadership in this critical area and would be interested to hear industries. Feedback on this initiative as well as what concepts you think should be included in the principles. We believe that principles are a key first step, but they are not sufficient on their own. That is why we are partnering with the private sector and other like minded governments on research and development trials, test beds and capacity building to promote a global transition to open and interoperable networks. Continue close coordination between the US government, private sector, academia, an international government partners is required to ensure the adoption of policies, standards, guidelines and procurement strategies that reinforce 5G vendor diversity and foster market competition. To this end, an as NTIA acting administrator, Evelyn Romale, mentioned earlier today, NTIA has recently formed the 5G vendor Diversity Working Group to coordinate US government efforts to increase the range of vendors offering 5G. Network equipment and services. One key part of this work stream is coordinating US government outreach to foreign governments and stakeholders. Now there are number of agencies that are actively participating in this working group and undertaking a range of efforts to support vendor diversity both domestically and abroad. One of the key agencies promoting 5G deployment vendor diversity. An open, interoperable networks abroad, is the US Agency for International Development, and as such I would like to turn it over to Tom Kowski who is the digital inclusion team lead at USAID's Innovation Technology and Research Hub to discuss some of USA ID's efforts over to Utah. Thank you Jason and thank UNTIA for organizing this excellent event in for your leadership and thanks everyone in the industry and our partners and representatives here on the call today. Over the last few months, I as I've learned more about open ran. I've been encouraged and excited to learn about how this exciting emerging industry sees developing countries as an important market opportunity for virtualized network deployments. USAID last year launched a digital strategy that outlines our agencies approach to how to grow inclusive digital infrastructure and how that inclusive digital infrastructure plays a critical role in the country's long term sustainable development. The digital strategy squarely makes the promotion of open, inclusive, reliable, and secure networks a key part of the work that we do in our 80 missions worldwide. The digital strategy follows 25 years of history at USAID in promoting and open an innovative Internet in developing countries. Beginning in 1996, USAID is Leland Initiative established some of the first Internet access points in Sub Saharan Africa. Other projects following on help countries right national broadband plans reform their spectrum licensing policies establishing universal access, another telecommunications regulations. The innovation Technology and Research Hub where I work also invested directly in innovation. A few years ago, USAID provided initial seed funding to a great group of researchers at California, Berkeley that we're working to build what they called a cellular network in the box, you. Sing a quirky, innovative and interesting ground up initiative called Open BTS. A USAID help funding helped them commercialize at architecture, where it was deployed on a trial basis in Philippines and Indonesia. Those of you that are familiar with the history of of the Open ran technology know subsequently that that company called Indago was acquired by Facebook in 2015 and a year later, Facebook launched the tip. The telecom infrastructure project. In developing countries, as we've touched down earlier today, developing countries face significant critical challenges. Close Internet architectures that are promoted by Wawa in ZTE are tide to the hip with the PRC's Belt, and Rd initiative in debt diplomacy. These clothes architectures invariably present a quick and

easy and inexpensive answer to the connectivity and network access challenges that many developing countries face. USAID missions abroad are working hard with our interagency partners at state on the Department of Commerce. To counter these tempting offers, which are Wolf in sheep's clothing? We see open ran in virtualized networks as a key part of the solution. One way in which USAID works with our interagency partners in the industry is through the digital connectivity in Cyber Security Partnership or DCP. The DCP is focused on helping developing countries build inclusive, open, secure and reliable ecosystems by expanding secure networks, advancing open Internet and procompetitive ICT policies and regulations, advancing opportunities for ICT and digital trade, and building cybersecurity capacity. Through the DCP, USAID engages the business community on ICT policy issues and provides expert advice to ministries. If any of the industry partners in this discussion today are facing politics, policy challenges to growing your business in a particular developing country, I would encourage you to reach out to me or to articulate them in this following discussion. And we can explore whether our DCP programs can help breakdown those barriers. In addition, USAID's recently launched a new project focusing specifically on building ties between the opener and industry in our development professionals and governments abroad. We want this project to demonstrate the business case as well as the development opportunities that open around technology offers for developing countries around the world. We are working with the access part of consultancy called the Access Partnership, represented by Dileep on this conference today. On this project, this project is building towards a series of regional briefings coming up. This may will be reaching out to many of you over the next few months. If you're interested in participating in this project or in this workshops, please feel free to reach out to me at [tomkautskyortkautsky@usaid.gov](mailto:tomkautskyortkautsky@usaid.gov) or anyone at NTIA can put you in touch with delete. For myself. I'm looking forward to this international engagement discussion today and I hope you can all educate me on various development opportunities and successes that you may be seeing in the markets in which you are trying to grow your business is. Thank you. Thank you so much Tom, and with that prompt I is. I remember please feel free to raise your hand if you have things that you would like to share or interventions that you want to make in anything that you've heard so far. If you were on the phone, please make sure that you email me tehoh. Tha LL at N tia.gov. I will take this opportunity to once again note that this is going. This is being recorded. We are planning on posting to our website short as soon as we possibly can. And, uh, we would love your participation in in this conversation. Again, the topic that we are that we are working on right now is how can the US government properly engage internationally to ensure that we are pursuing vendor diversity, not just simply domestically, but also abroad with our partners? As Tom noted, in developing markets and ensuring that we are in fact I'm pushing back on some of the lock in models that we have seen coming out of. Out of other out of China. So if you have comments on that, please raise your hand or you can again email me at [t.hallthall@ntia.gov](mailto:t.hallthall@ntia.gov). Also, if you had a few thoughts or comments on an earlier topic or issue that you did not have an opportunity to kind of raise, but you would like to make the intervention, that would be great. And I see John Baker has his hand up. Let's go ahead and go to John if you could make John an APAR presenter and then John will be able to unmute yourself. Yeah, thanks Travis John Baker from Albany. A couple of points really on a global basis and also somewhat on a local basis. I think you know as we see it globally, there's this move to keep keep open rain or supply chain diversification in the standards groups and and on the basis that if if it's if it's kept a celebratory exercise or a standard exercise then essentially open round will fail and Azita said you know operators will go ahead and diploid existing equipment. And be locked in forever. So that's one

point. Secondly, you know, diversification will only happen when interoperability actually starts to take place, and as much as you know people saying that they are out in the open round, you know we memory only believe that people are in open round when interoperability starts to happen, and so far you know the offers for interoperability testing with certain vendors are falling on deaf ears, so you know, that's another. The key point to keep chasing on a global basis as the vendor ecosystem is supported. And Lastly, you know his control of the supply chain for components and equipment and you know there's something that needs to be watched. And we've seen instances where supply chain is feels threatened because moving into a new technology area, so it goes against some of the incumbent strategies. So there's three key points, I think. The you know we're seeing both on a local and global basis. Thanks Travis. Great, thank you so much. Any thoughts, reactions to some of those points? Certainly raising a lot of issues that are extraordinary topical questions around the supply chain. We have questions around some of the activities and how they link domestically and internationally. So I did. This is your opportunity to raise your hand. We have Jeffrey Marks from Nokia. We can go ahead and make Jeffrey a presenter and Jeffrey will be able to meet yourself. Thank you. Jeffrey, you should be able to unmute yourself now. How was that? Can you have any great? I'm just wanted to react to the recent comment about having things go through standards, relegates them to a lab environment. I want to say that you know Nokia is is very bullish on an open Rand, but we're also. We we we believe that it's important that there be a standardized environment where you can where carriers can buy or anyone who wants to implement open Rand can purchase from multiple vendors and know they're going to work together without those vendors having bilateral agreements or having to do things in that way so we don't see standardizing the technology like like like is done that didn't successfully for for other. You know radio Technologies is is a negative or or is something to like keep Orana cage far from it. We believe it's important for the thriving of open RAM in the future. Great, thank you so much and Tom. Go ahead and let yourself. Yeah, I know it's it's supposed to be listening session, but I did want to ask a question from the government perspective, particularly to take advantage of all the industry participants on the group when when we have started our discussions with with developing country governments and policy makers on open ran. I I find it instructive to talk about the the local development opportunities that an open competitive architecture offers. The example I always keep turning into is is the opportunities for white box local white box manufacturing in the country. So I'd like to. I'd like to use this form to find out if there are other useful examples or field examples that the industry has encountered where in addition to the opportunity to to making equipment domestically. What other types of discussion, talking points, or work as or or or projects have you found to be developing country to be particularly particularly interested in or receptive to? Or maybe even example that you hadn't thought of that might be analogous to local menu. Actually. Great and well everyone is thinking about that product that prompt Alex. Why don't you go ahead? Yep, can you hear me OK? We can thank you. So first of all, thanks so much for convening this this session today. For folks that don't know me, Alex Botting with the open Round Policy Coalition and I've LED our international engagement over the past four or five months where we've engaged with about 25 governments from around the world. I would say there's sort of three buckets of activity that can be helpful here, and it's somewhat dependent upon. This situation of the government that you are talking to the first is educate for many governments. This is a new concept both from a technical standpoint, but understanding the impact of it as well and to the extent that the US government can continue the work that they have been doing in this space to educate foreign governments about the technology, talk about some of the benefits, including in

many cases. Things like helping to close the digital divide because of the flexibility and cost effectiveness that open rank and bring with it. I think that's a message that will resonate pretty well. US government's been good on this already and you know we look forward to future opportunities to collaborate on the education piece. Second would be coordination and sharing best practices with partner governments. From a policy standpoint. Yeah. And then in more of an ongoing fashion, once those policies are in place. So things like investment in R&D, standing up, testbeds, things like that. It's important that there's ongoing information sharing between governments as well so that we're not duplicating activities or or making the same mistakes along the way. Or even you know, spending finite dollars, too. Sort of replicate activities in a way that doesn't drive things forward, and then the final one is encourage activity. It's all too easy for governments, even if they see the benefits here to sort of sit on their hands and see how things play out. But you know, activity from government is required, as as we've said particular in in on the fiscal side of things where that's feasible to drive things forward in a timely fashion. And. Demonstrating the work that the US government's doing, but also governments like the UK, Germany, Japan and others I think is a good way to encourage other partners to follow suit. The final thing I'd say is just a plug for a document that we've pulled together or open Ram policy Road map, which lays out the various tools that governments have at their disposal to. I put forward policies that can help accelerate open round adoption thing that's up on the open round policy coalitions website and for government to a newer in this space. It's quite a good document for providing an overview of the various levers they may have at their disposal to accelerate adoption, but thanks again for having us today. Thank you so much Alex. Let's go ahead and go back to John and again a plug for for Tom's request for some good examples for him to use in his work. Yeah, I think this is this response is sorta Toms question. You know we see you as being a leader in virtualization and open run. You know we see a lot of in fact involved in a lot of discussions on a global basis about localization of software development and. The technology and one of the areas that we find that local countries want to get involved in is the actual radio designs themselves. Because you know every country. Although following somewhat of an ITU type of spectrum policy always have local country variants and that's a great way for countries to build an expertise in radio design. Now you know one of the barriers that's really going to be addressed in. All of that is access to Silicon. You know, as as the chat from Xilinx talked about earlier, so I apologize for the name. You know, he's talking about access to chips, access to reference designs, and then you know the localization in terms of filters, casings, manufacturings and everything else could be done on a local basis so you know there's a pent up demand to go do this, But you know, access to low-cost Silicon if you like in terms of building radio reference designs is that is a key issue. Great, thank you so much John. So again we have some time left to discuss the challenges that we that you as companies are facing internationally. Things that you think that the United States government should do. Again we are in the middle of a transition. Argus were a little bit into the transition at this point in time. What should the new administration be looking at you? What should we be thinking about and in this space, and where should we be engaging? Where should we be putting our firepower? And I've seen the leaps hand up. So if we can get him to be a presenter, delete, you are good to go. Thanks, Travis. Again, delete your hiring from access partnership since we haven't talked about it yet. I just wanted to raise the multilateral fund that was authorized in the USA Telecommunications Act and which is not yet been, which is an authorized. But of course is not yet been appropriated. Although a number of folks in industry, including access partnership, when some of our work are hoping and working to help, will get appropriated this year. Whether



it's you know, part of you know, Senator Schumer's package that he just announced, or some other initiative lot of bipartisan support for that. I don't have the language of the statute in front of me, but, you know, it occurred to me that maybe a lot of people are thinking about that in terms of OK. What can the US government do? You know, overseas? And how can it distribute its funding to? Operators, you know. I almost wonder if maybe the US government should also begin essentially doing some ground work on international authorization to really make that a multilateral fund where other countries see that the US is moving ahead on this, and maybe they will come to the table with some of their money on their own. And it could be sort of a multilateral project. Great to hear, for example, that Jativa and is working with USUK on putting principles together for the G7. So maybe the State Department. You know that fund on the assumption that it's going to be appropriated could be worked into this, so I just wanted to mention that fund as part of this conversation, since I think it will be an important piece. Great, thank you so much. One of the things that came up in the in the sum of the previous comments was standards and the use of standards and standards bodies. This is something that we dealt quite a bit into in our request for comment. It's not something works we've explicitly mentioned in the agenda here, but something that we would be of course welcome thoughts on in terms of what the US engagement should be on within standards bodies. Of course, today we're talking about gender diversity and that of course you know primarily focused on things like. Iran, um but standards are not just simply, you know, national standards, particularly the US approaches them. If the folks have thoughts on US, participation in and promotion of US industry participation in or allied country participation in or partners participation in standards bodies, an what the focus should be, what we should be doing, we'd love to also hear thoughts on that. And with that again, I'll just. Do the housekeeping notes, uh, we please raise your hand if you're on the phone, please shoot me an email tehola@ntia.gov and we have Paul I if we can make Paul a presenter and then Paul you should be able to unmute yourself. Yeah yeah, thanks Travis. Yeah I mean I think this standards are really important and so you can't scale a technology and less you have the standard sorted out right? Because what happens is you have individual integration challenges or I did it. This way you did it this way so they really underpin everything. And if you look at the cellular telecom industry around the world today, the three GPP really defined the open standards that we have today and so the air interface from the from the device to the network from the RAN to the core and an end to end basis. I think there's 15,000 different specifications that define that. It's a huge body of work, so that's really critical and you know you could argue that the most successful open standards organization to date now. I think now if we look at Oran Alliance then around Alliance, then picks up those three GPP standards and enhances and adds to them. But what's important, I think, is it is for the good of everyone to have a global set of standards, right? 'cause that gives the scale in the industry. And that's why our industry so successful. So I think keeping alignment with GPS really important. And then as we add, add to that we need. So as we look at our end alliance. They're taking those baseline standards and then Addington, so I think that's there are sort of two important. Can initiatives that we should work on. And then I think making sure that the voting and contribution processes in each of those organizations done a good way, but I think it would be helpful to have US participation in those standards organizations, and probably more more so than it has been to date, to represent the interests. And then if you look at in three GPP how organizations like artists represent in sort of the arm of 3GP in the USI mean, I think using using that organization as well to to look after US interests as well. So I think it's keeping global standards using 3GP as a baseline. Focusing on our online specifications standards, doing a really good job of that

standard process is really critical for the USI think. Thank you so much, uh, others have any thoughts on that topic? Or of course, you're welcome to chime in on other aspects of the international piece, or if you know you really have a burning point that you'd like to make about domestic or just simply the general technology where we welcomed as well, we have Courtney Lang. If we could make Courtney a presenter, and Courtney, you should be able to unmute yourself. Go ahead. I muted sorry about that am I now immune problem? You're good to go you know just one of those days. Thank you for hosting this listening session and appreciate you bringing up standards. Certainly really really important to 5G. I think we've heard you know from a couple of folks today, particularly about the importance of relying on open standards. In particular, I would just want to make some comments more broadly on standards and kind of ways in which we see standards being important and how. How the USG in particular can support. Industry participation standards bodies. I think you know, kind of the big common denominator to this is is really supporting industry lead bodies with those transparent, well understood rules based processes already in place. I think it's really important that US companies aren't restricted in the decisions that they make to choose. You know which bodies are best suited to their work, so figuring out how to support the industry participation in those bodies is super important. I think. Also encouraging again other nations to rely on and. Really reference international standards in their relevant policies and regulations, particularly in the context of 5G, but also, more broadly, is something incredibly important, I think. Beyond that, you know ensuring that current and future policies and regulations do unintentionally inhibit US company participation at international standards. I'm sure you guys are aware of the entity listing and designation of Wowway previously had provided some complications for industry. Trying to participate in standards bodies so. You know moving forward, just making sure that policies don't unintentionally inhibit that participation. And then I think finally kind of at the broadest level, just making sure to continue to engage regularly with US stakeholders who are participating in three GPP, another meetings to make sure that information is flowing. Both ways. I think you know, really. Consistent engagement can help ensure that everybody is kind of on the same page about what's happening in those bodies. Kind of what misunderstandings might be occurring. Ann. Just kind of continuing to keep that line of communication. Open so that any policy is that the US government or activities at the US government undertakes is founded in kind of anecdotal evidence that that can be provided by industry, so those are just some top line points. I'm sure nothing is incredibly surprising there, but did just want to kind of make make the case more broadly for how the US can appropriately support industry lead bodies. Thanks so much again. Great thank you, Courtney. By any other thoughts? Again, we're we're happy. We're looking generally at how the United States can push the policy goal of ensuring gender diversity by with our partners and with our with partner countries partner organizations. One piece of that, of course, is standards as we were discussed, but there are many other aspects as well, so we have delete and then Alex so delete, go ahead as soon as your main interpreter. Sure, just briefly on standards fully agree with everything that Courtney just said about giving industry flexibility. There has been talk in the past. Some companies are maybe for it, others may not, depending on where they sit about having the US government do more to encourage companies to send representatives to participate in global standards bodies. Ideas like maybe you know, modifying the R&D tax credit to make clear that companies can receive money or subsidies in some way. For sending representatives to the global standards bodies, some companies will fear either that they wouldn't participate, get to participate in that, or they fear it would send the wrong signal to the rest of the world in terms of the US trying to politicize the standards process so you

know, I just wanted to throw that out there that you know there are there. There are potentially some policy options, but that if you do go down that route or make a recommendation to Congress to do that, that it should just be done in a nuanced and kind of careful way. To make sure that it doesn't look like the US is politicizing the process, thanks. Thank you so much Alex. Go ahead. Yeah, thanks Alex. Spotting with the Open Policy coalition again. Those mentioned earlier of the G7, and understanding that this is a listening session for NTI and not a speaking session, it would be great if there is any more information, but folks are able to share on that either now or afterwards. I think we've really welcome learning a bit more about it. More generally, I would say you know, multilateral forums are going to be a big piece of the puzzle here. We've heard talk about. Yeah, sort of D10 group being pulled together. The quad is one that's you know. Increasingly active group. We know there's some activity in APEC and we've heard talk on the industry side about NATO perhaps being another vector that or another forum that could be utilized here. So any information that you're able to share on other plans in multilateral forums would be welcome. But just a general sort of plug for. Using any and all avenues available to drive this forward with different coalitions of partners. I will let our our leadership think about that just for a minute, but in the mean time, why don't we turn to azeda and then Liam so O will go ahead and make you presenter and you should be able to meet yourself. And then we'll then we'll turn to leave. Thank you Travis. I wanted to go back to Tom's question about white boxes for developing countries for the radios and I just wanted to say that for us. Since we deeply understand the components that go into their radio units were actually doing that whole designing after, are you and then working with our partners to bring it as a product so that we could use. So, for example, our millimeter wave base station, which creates a 28 GHz. We've designed it with our partners and that is at the price point of an outdoor Wi-Fi. Access points, so that's not just something that you do for developing countries and kind of making it sound like maybe it's not full featured, but it's something that you can use in developed nations and just to reduce the cost. So we are very cost conscious 'cause we want to pass those savings onto our subscribers and as such we really pay attention to every component that goes in there and those radio units can be used in all kinds of networks, whether it's developing nations or intervention. Thank you. Promise that you. Thank you Liam. God. Yeah, whenever we talk about standards, obviously it's very critical that you know from the US perspective that we're doing the most Advanced Research in our universities and one of the things that we've noticed as we work with companies relative to things like reference designs using our parts is sometimes it's easier to find universities in other localities. For example, places like Germany that have much more capability in this area and one of the things that I feel. Is critical is to have a pipeline of very much Advanced Research in this area and I hate to bring up the dreaded 6G word, but nonetheless, right, we do need to be thinking for the future as well, of how we can influence technology going forward. And to be honest, I don't think we're really extremely well positioned from a research perspective to drive some of those things. I think there is a lot of activity, but I think some one of the biggest issues we see is the connection between universities. And real world applications. And I think we need to continue pushing that as we move forward. Thank you so much Liam. Let me give a one last prompt if you are on the phone. He Hall tha LL at Ntia dot giovini if you are on teams please feel free to raise your hand. We are looking for again feedback on how to pursue the goal of gender diversity internationally with our partners with developing nations. And I, and ensuring that we are pushing towards that goal. And since I'm not actually seeing any hands right now, you you have a while I'm talking, you have the the opportunity. Right now I'm going to get the opportunity to have the last word before I turn it

back to 2 Evelyn remotely or acting associate administrator, acting Assistant secretary and administrator. So if anyone would like to have the last word closing out this listening session, now is your chance. And seeing one let me go ahead and turn it back to Evelyn and will be able to give some folks folks a little bit back. A little bit of time back in there. More afternoons and mornings. So go ahead, Evelyn. Thank you Travis and of course I'm always happy to have the last word, so appreciate that. Just want to take a moment to thank all of our participants today. Everyone who was able to join us in terms of next steps from both our first listening session and today's will be building the feedback from both of these sessions into proceedings. Report to share with the administration. We really appreciate we've had so many takeaways from today's session as well as the session in January on incentives. So we're looking forward to having a robust report to provide, along with your recommendations. You know, I can't stress enough just how critical this issue is. Of course, I know we all know that the having robust and resilient 5G networks. To carry us into this next wave of innovation for the US and the globe, as well as allowing more inclusion for a society and connectivity with the networks, is just so critical, making sure that they are robust, secure that we have robust competition, an that diversity to make sure that is possible is so critical to where we're headed, and the stakes are so high. So we very much appreciate. Industry jumping in with us as we talk through these issues, it's clear that the state of industry leadership in this area is very strong. We see that very much and it's just useful to have the conversation with you as we map out on next steps for the USG in this area as well. So again, thank you for taking your time to share this feedback and we look forward to. Next steps in terms of the partnership on these issues with you and be well, everyone and we will be back in touch on this effort soon. Thank you. Thanks all.