

The background features a view of Earth from space, with the horizon and atmosphere visible. Below the Earth, the surface of the Moon is shown, appearing dark and cratered. A complex network of glowing green and blue lines and dots is overlaid on the scene, representing a global or space-based communication network. The lines curve across the Earth and connect various points, some of which are highlighted with bright green and blue lights. The overall aesthetic is futuristic and technological.

# CSMAC Subcommittee 2: 6G

December 19, 2023

# Subcommittee Members

- Reza Arefi, Co-Chair
- Carolyn Kahn, Co-Chair
- Michael Calabrese
- Thomas S. Dombrowsky Jr.
- Mark Gibson
- Dale Hatfield
- Jennifer Manner
- Jennifer McCarthy
- Danielle Piñeres
- Glenn Reynolds
- Dennis Roberson
- Jesse Russell
- Steve Sharkey
- Mariam Sorond
- Rikin Thakker
- Jennifer Warren
- Kevin Holmes, FCC Observer
- Richard Orsulak, NTIA Liaison
- Jessica Quinley, FCC Liaison
- Antonio Richardson, Designated Federal Officer

# Mandate

- NTIA seeks input on what sort of use cases 6G may entail
  - Importantly, NTIA would like the CSMAC to consider use cases beyond traditional wireless communications including safety, sensor, radar, space and other scientific applications and address 6G's potential impact on federal government users
- When considering spectrum bands that could be used to support 6G, NTIA observes that the THz bands have been identified for potential use
  - How would such use impact government users in that range and what recommendations could be made to help prepare for this
  - Are there other spectrum bands that may be appropriate for 6G and beyond use?

NTIA Clarification: The scope should concentrate on 6G services only. This effort should consider generally the benefits of 6G, the positives for the federal government as a user or federal equities, and how federal agencies can benefit broadly from 6G.

# Approach

- Scoped the work and developed a study plan and report outline
- Collected key reference materials
- Conducted about 40 interviews with federal agencies, service providers, equipment manufacturers, and academia and other non-profit organizations
- Held over 25 subcommittee meetings to foster ongoing cross-sectional analysis, inputs, and discussion
- Developed a 6G vision, findings, and recommendations addressing the mandate given to the subcommittee by NTIA

# Summary of Updates

- Incorporated comments received on draft report
  - Discussion during September 2023 CSMAC meeting
  - CSMAC comments
  - Public comments
- Included National Spectrum Strategy and ITU updates
- Added references
- Refined recommendations

# Report Outline

- Mandate
- Approach
- 6G vision
- Overview of organizations involved in 6G development
- Key application drivers
- 6G use cases
- Potential use of 6G by federal government users
- Technologies and technical capabilities of 6G
- Potential spectrum bands to support 6G and potential implications to government users
- International considerations
- Findings
- Recommendations to help prepare for impact to government users
- CSMAC recommendations

# Outline of Recommendations

- CSMAC recommendations to help prepare for impact to government users (slide 8)
- Overall CSMAC recommendations (slide 9)
  - CSMAC use case recommendations (slide 10)
  - CSMAC spectrum recommendations (slide 11)

# CSMAC Recommendations to Help Prepare for Impact to Government Users

*Caveat, and in line with the mandate from NTIA: our report does not include operational impacts to federal government users*

1. NTIA should work with the FCC and federal agencies to develop more spectrum sharing-friendly plans and designs across government and commercial systems.
  - a. NTIA should engage early with federal incumbents with assignments in bands of particular interest for 6G, including mid-bands and above 95 GHz, to understand the type and degree of use and ability to share.
  - b. NTIA should work with FCC to leverage more data-driven, automated, and dynamic methods into its plans, such as the incumbent informing capability vision and use of schedulers.
2. NTIA should work with the FCC, federal agencies, the White House, and Congress to consider acquisition reform and incentives for federal agencies and commercial industry to use spectrum as efficiently and effectively as possible to increase spectrum sharing and/or facilitate relocation, as appropriate.



# Overall CSMAC Recommendations

1. NTIA should prioritize its long-term, strategic planning and preparation for use of next-generation communication technologies. This effort could be coordinated through the newly established Interagency Spectrum Advisory Council and incorporated into its charter to advise NTIA on spectrum policy matters and inform NTIA on the diverse missions of the federal agencies.
2. CSMAC recommends NTIA establish a 6G Subcommittee during the next term of CSMAC to continue examining issues such as use cases, spectrum, additional capability, interoperability, and risk.

# CSMAC Use Case Recommendations

3. NTIA should work with federal agencies such as through the Interagency Spectrum Advisory Council to identify if and when commercial 6G services would benefit their missions, characterize any expected differentiated requirements (such as related to standards, security, and technical performance criteria) in alignment with the ITU-R timeline, and coordinate with industry and trade associations to address federal agencies' requirements.
4. NTIA should seek additional funding to allow the Institute for Telecommunications Sciences (ITS) to develop federal agency use cases in partnership with the federal agencies and in alignment with the ITU-R timeline.

# CSMAC Spectrum Recommendations

5. NTIA should work with the FCC, federal agencies, the White House, and Congress to proactively help prepare for the impact of 6G to government users, as described on slide 7.
6. NTIA should work with federal agencies to update the spectrum compendium more frequently, adding additional, more detailed and granular data, e.g., location and time of use, describing federal spectrum uses and extending its compendium above 7.125 GHz to at least the THz range.
7. NTIA should adopt a “toolbox” approach to spectrum sharing to best match sharing approaches to specific conditions by customizing sharing techniques to frequency band and range of incumbent systems (including commercial incumbents) and consider the requirements of commercial services in the process of devising and implementing new sharing methods. Also, less management may be required in the sub-THz or THz ranges where propagation, including building losses, are helpful in enabling sharing.
8. NTIA should collaborate with the FCC to facilitate innovation in THz spectrum for 6G on an exploratory basis (e.g., waivers, possible additional unlicensed spectrum), considering that operations tend to be localized based on the propagation characteristics of this range.

*CSMAC recognizes that NTIA and federal agencies need more resources to participate effectively in helping to prepare for 6G's impact to government users, incorporate next-generation federal agency requirements, and advance and tailor sharing approaches to specific situations.*



# Discussion