



The Next G Alliance: What it is, How it Works, and Spectrum Sharing

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Technical Program Director, Next G Alliance

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NGA Overview



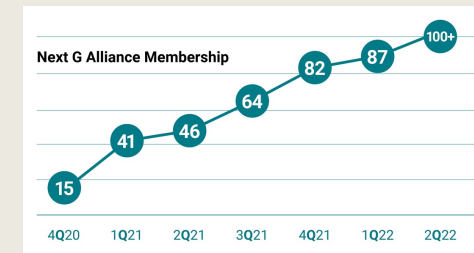
- > ATIS formed Next G Alliance in late 2020



- > "Roadmap to 6G" published February 2022 provides foundation for North American 6G vision and leadership



- > Broad ecosystem of contributors



- Operators
- Vendors
- Hyperscalers
- Academia
- Government
- Research Labs

- > More than 800 experts across ~90 members

North America's Six Audacious Goals

- > Top priorities for North America's contribution and Next G leadership
- > Selected by Next G Alliance membership
- > Address multiple stakeholder interests



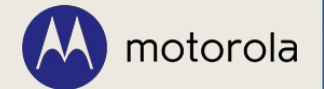
Full Members



A grid of logos for full members of the Next G Alliance, arranged in six rows and six columns:

- Row 1: AMD (together we advance_), Apple, AT&T, Bell, Booz | Allen | Hamilton, Charter Communications
- Row 2: ciena, CISCO, DELL, ERICSSON, Google, Hewlett Packard Enterprise
- Row 3: intel, interdigital, JMA, KEYSIGHT, LG, LOCKHEED MARTIN
- Row 4: MAVENIR, MEDIATEK, Microsoft, MITRE, NOKIA, Qualcomm
- Row 5: SAMSUNG, SHARP LABORATORIES OF AMERICA, T Mobile, TELUS, tsmc, uscellular
- Row 6: verizon, VIAVI

Contributing Members



Also:

- MIT
- University of Toronto

Government Members



U.S. Department of Defense




Technical Work Groups



National 6G
Roadmap



Technology




Applications



Societal/Economic
Needs



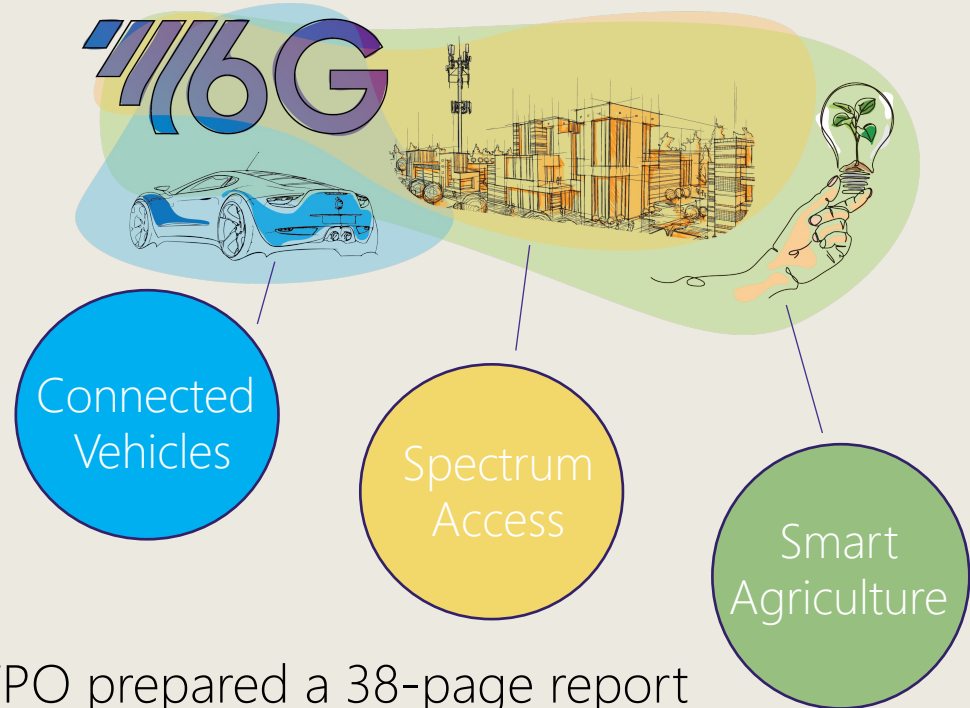
Spectrum



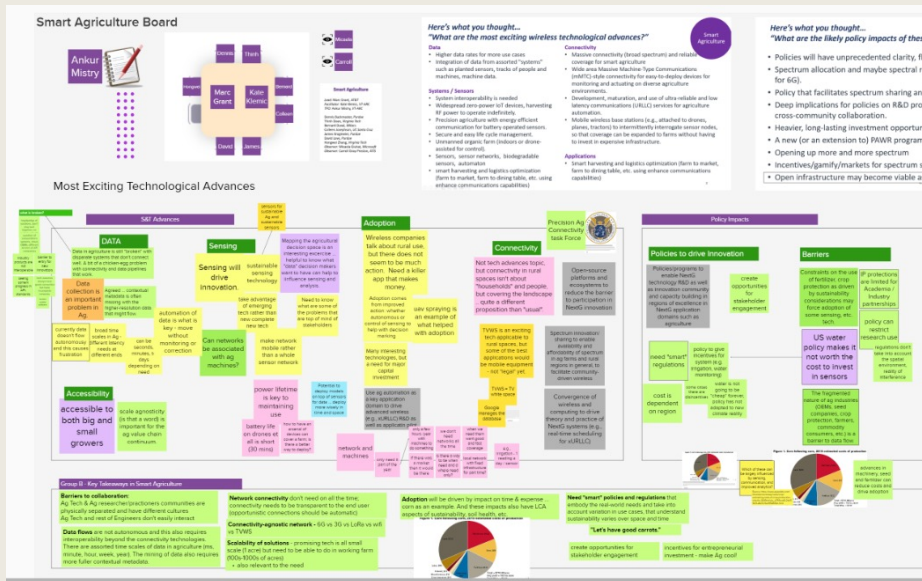
Green G

Academic Workshop

Objective: Collaboration among the academic members of the NGA and select industry moderators to develop an academic perspective on three key technology areas for the next version of the 6G Roadmap.



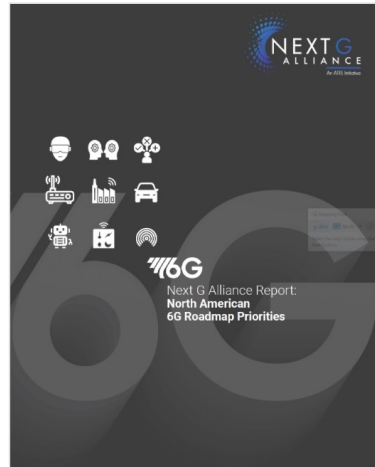
Outcome: TPO prepared a 38-page report highlighting important research areas to focus on and impacts on policy for each technology area.



Recent Publications



Spectrum Needs for 6G



North American 6G Roadmap Priorities



6G Radio Technology Part II: Basic Radio Technologies



6G Technology Management and Orchestration

Distributed Sensing and Communications

Evolution of Sustainability Indicators for Next-Generation Radio Network Technologies

6G Radio Technology Part I: Basic Radio Technologies

Shaping Tomorrow: The Evolution of Personalized Digital Experiences Through 6G Technologies

6G Spectrum Considerations

Beyond Speed: Promoting Social and Economic Opportunities through 6G and Beyond

6G Technologies for Wide Area Cloud Evolution

6G: The Next Frontier of Innovation and Investment

Network-Enabled Robotic and Autonomous Systems

6G Roadmap for Vertical Industries

AI-Native Wireless Networks

6G Sustainability KPI Assessment Introduction and Gap Analysis

Research Council



- > Advocate for NGA's research priorities with government and academic research communities.
- > Assist NGA on prioritizing research priorities.
- > Educate NGA on existing sources of research funding, including governmental and industrial.
- > Explore and identify future government and private sector partnership models for 6G Research.



Members



Academic

- > Dr. Robert Heath, NC State University
- > Dr. Ekram Hossain, University of Manitoba
- > Dr. Nick Laneman, Notre Dame
- > Dr. Muriel Médard, Massachusetts Institute of Technology
- > Dr. Tommaso Melodia, Northeastern
- > Dr. Ted Rappaport, New York University
- > Dr. Şennur Ulukuş, University of Maryland
- > Dr. Wei Yu, University of Toronto

Industry

- > Dr. Egeman Çetinkaya, Verizon
- > Dr. Andrew Clegg, Google
- > Dr. Amitava Ghosh, Nokia
- > Dr. Nageen Himayat, Intel
- > Dr. Ali Khayrallah, Ericsson
- > Dr. Venki Ramaswamy, MITRE
- > Dr. Ed Tiedemann, Qualcomm
- > Dr. Chonggang Wang, InterDigital

Led by: Dr. Eric Burger, Technical Program Director, NGA and Research Professor, Virginia Tech

Policy Committee Representative: Mr. Jeff Stewart, AT&T

ATIS Lead: Mr. David Young, Managing Director, NGA

Research Priorities

- > The Next G Alliance's research priorities is a collective compass for North America's 6G innovation platforms and the region's technology landscape.
- > Security, Trust, & Resilience
- > New Radio Components and Antennas
- > Network Convergence and Integration
- > AI/ML
- > Spectrum Sharing and Enhanced Spectrum Access
- > Radio Access Technologies
- > Joint Communication and Sensing
- > Architecture and Control of Open, Disaggregated Systems
- > Sustainability / Reduced Energy Consumption & Cost
- > Cloud Native Networks and Distributed Cloud

Delivering Powerful 6G Applications that will Drive Future Innovation

Multi-Sensory Extended Reality (XR)

Innovative collection of immersive technologies that include Artificial Reality (AR), Mixed Reality (MR), and Virtual Reality (VR) for online sports and gaming, coordination for remote team operations, and interactive classrooms.

- Ultra-realistic interactive sports
- Innovative game entertainment
- Digital Twins
- AR co-design
- MR telepresence
- Immersive education
- High-speed connectivity to aerial vehicles

User interface depends on high-fidelity pictures (AR, MR, 3D displays) e.g., holographic imaging, and ultra-sensitive and responsive interactions between the user and controlled objects.

Distributed Sensing and Communications

Sensors tightly integrated with communications to support autonomous systems. Markets include health care, agriculture, and environmental safety.

- Remote data collection
- Unattended, reusable and implants
- Addressing quality, availability, and adoption to extensive digital divide
- Public safety applications
- Synchronous data channels for sensors
- In-body networks for health

Ubiquitous connectivity with options such as massive throughput and ultra-low power operating modes from network providers and device manufacturers.

Realizing the Next Generation of 6G Radio Systems and Devices

Advanced MIMO and THz/SubTHz

To build upon and extend the 5G multiple-input and multiple-output (MIMO) framework and leverage the abundance of spectrum at sub-THz (100 GHz to 300 GHz) and Terahertz (300 GHz to 1 THz) frequencies can enable new use cases such as holographic services.

- AR, MR, telepresence, data center interconnectivity, AR, high positioning accuracy, critical medical communications, non-invasive health monitoring
- Smart vehicles, peer-to-peer SOS messaging, device-to-device based inter-vehicle, swarm communications

New areas of THz/subTHz communications would further extend North American leadership into the next generation and help other wireless communications into the Tbps regime.

6G Air Interfaces

Radio technologies for new topologies and networking such as User Equipment (UE) cooperative communication, Non-Terrestrial Networks (NTN), and mesh networking will support new types of connectivity.

- Coexistence of TN with NTN
- Indoor deployment models
- Full duplex, millimeter, centimeter, and subTHz deployments

Air interface enablement for distributed computing and intelligence is a key enabler for incorporating mobile device computing into the 6G edge-area cloud and enabling efficient computing and workload distribution.

Creating a Sustainable 6G Ecosystem and Enabling other Industries

Reuse and Recycle of Water, Waste, and Materials

The current economic model to linear, which is based on a take-make-waste-dispose model. Transitioning to a circular economy with reusable waste products includes reused, recovered, and renewable products.

- Reuse and recycling of water and waste in ICT networks
- Advancements in device and network hardware
- Recovery of components and materials, like rare material

Re-design manufacturing processes to be more sustainable and use more recycled, recyclable, and sustainable components, includes recovery of raw and rare materials.

Sustainable Network Optimization

Achieving network sustainability goals across end user and Internet of Things (IoT) devices, radio access networks, core, and data center networks/cloud domains.

- Network optimization of radio and core architectures
- Innovations to facilitate distributed data processing
- Energy efficient frequency bands

New power and spectral efficient designs, deeper virtualization, Artificial intelligence (AI)-enabled power management and software-enabled implementation of new features.

Advancing North American Societal, Economic, and Policy Goals

Quality of Life

6G-enabled services will be important to improving the **quality of life** in North America and its local communities, including areas such as public services, health care, education, safety and security, and the environment.

- Standards and measures to define quality of life
- Balance outcomes between quality of life and other societal goals
- Build strong and collaborative 6G ecosystems
- Identify key North American policy goals

Methods that establish connections between 6G innovative applications with improvements to everyday living and advancement of North American societal goals.

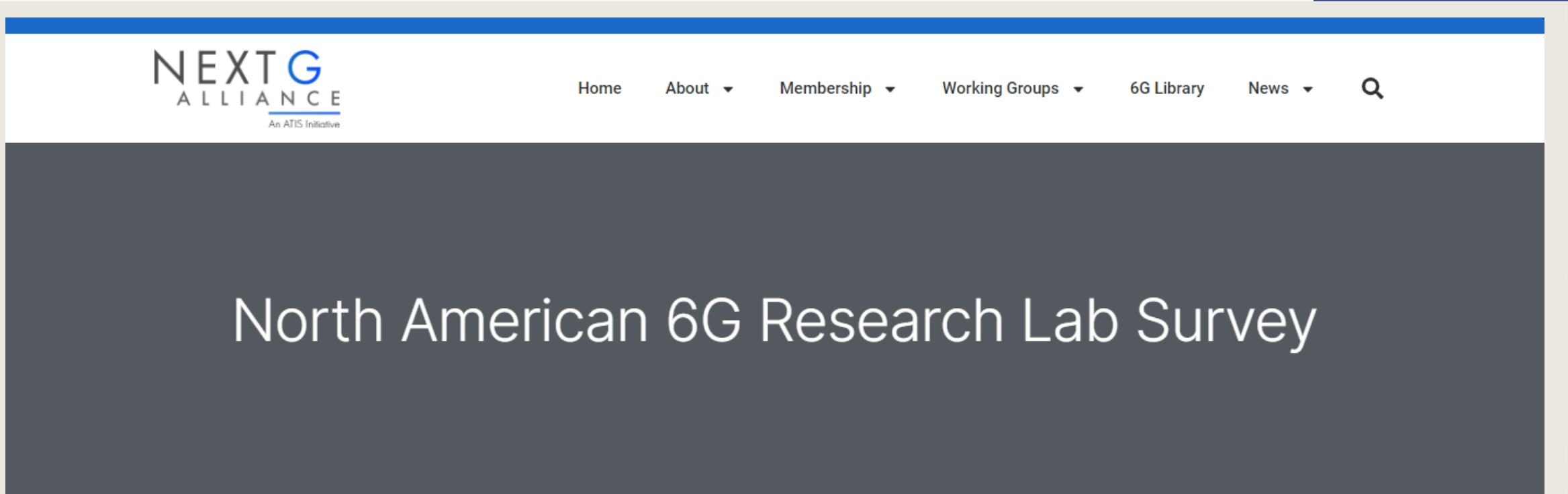
Digital Equity

6G-enabled services should promote **Digital Equity** goals, including affordability, accessibility, and geographic availability.

- Apply technology to advance security and cybersecurity protection
- Explore gaps in access to first language web content
- 6G to improve access to justice and court system
- Rural economic model innovation for 6G and beyond

Achieving the goals of extending reliable broadband connectivity to all individuals and communities to deliver outcomes that can be enabled by 6G innovation and services.

Lab Survey



<https://nextgalliance.org/research-council/north-american-6g-research-lab-survey/>

Lab Survey



Host Organization(s)	Lab Name	Lab Type
AT&T		Industry
Commonwealth Cyber Initiative	CCI xG Testbed	Academic
Department of Commerce	Institute for Telecommunication Sciences (ITS)	Government
Department of Energy, Idaho National Laboratory	Idaho National Laboratory	Government
Ericsson	D-15 Labs	Industry
Florida Atlantic University	Center for Connected Autonomy and AI	Academic
George Mason University	Mason Innovation Laboratory	Academic
George Mason University	NextG Wireless Lab	Academic
Google	Google Reston Wireless Lab	Industry
InterDigital	InterDigital - Wireless, Advanced Media, and Applied Artificial Intelligence Lab	Industry

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Next Steps: Spectrum WG

- > Just published *Spectrum Needs for 6G* report
- > Soon to publish: *Spectrum Access Mechanisms* report. Including chapters on:
 - > Regulation Trends
 - > Classification (e.g., Multi-RAT, spatio-temporal, context aware) and tools
 - > Incumbent Sharing (e.g., FSS, inter sat, passive services, MSS, PNT, etc.)



Image generated with Dall-E 3 with prompt, "spectrum sharing with radio waves and a satellite"



Building the foundation
for North American
leadership in 6G and beyond