

### Next G Alliance

### 6G Roadmap Overview

For The Networking Channel Webinar on *Transatlantic perspectives on 6G Vision, Roadmap and Development Model* 

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### Roadmap to 6G

Building the Foundation for North American Leadership in 6G and Beyond

- ATIS formed Next G Alliance in late 2020
- "Roadmap to 6G" published February 2022 to provide foundation for North American 6G Vision and Leadership
- Broad ecosystem of contributors



Operators Vendors Hyperscalers Academia Government Research Labs

600 experts across 82 members

# **Founding and Full Members**



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# **Contributing Members**



# **Government Members**





(a) U.S. Department of Defense





# **Foundations for Next G Alliance 6G Vision**



**Audacious Goals** create the framework for advancing North American leadership and positioning a robust 6G marketplace

**North American 6G Roadmap** defines the path for connecting every stage of the lifecycle and progressing to an end-of-decade 6G Vision



**6G Leadership Priorities** incorporate innovative applications, societal needs, economic goals, government actions and technology developments

# **Six Audacious Goals of our 6G Vision**

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





# **#1: Trust, Security and Resilience**



The 6G system will be trusted by people, businesses, and governments to be esilient, secure, privacy preserving, safe, reliable, and available under all circumstances.

### NATIONAL IMPERATIVES

- Dependable and trustworthy networks that underpin and accelerate digital transformation
- Secure sourcing for 6G technology and supply chains
- Greater competition from more diverse solution providers

### RESEARCH CHALLENGES

- Mission-critical service availability
- Resilience through automation and resource optimization
- Security and privacy for hardware and data
- Uses of trustworthy Artificial Intelligence

# **#2: Digital World Experience (DWE)**



6G will support multi-sensory experiences to enable transformative forms of humanhuman, human-machine, and machine-machine interactions that bring life-improving use cases and create new economic value.

### NATIONAL IMPERATIVES

- Closer integration of North American strengths in cloud computing and communications
- New and enhanced approaches to education, healthcare and workforce development
- Policies and programs to scale-up experimentation with 6G digital world applications

#### NEXT G ALLIANCE

### **RESEARCH CHALLENGES**

- Innovation in cyber-physical technologies, going beyond sight and sound
- Knowledge systems and extreme automation
- Open and interoperable standards across application and technology domains

## **#3: Cost Efficiency**



Ocst Efficiency in all aspects of the network architecture must be improved for delivering services in a variety of environments, including urban, rural, and suburban, while also supporting increased data speed and services

### NATIONAL IMPERATIVES

- Affordable access to services essential to American lives
- Policies addressing rural availability, infrastructure efficiencies and spectrum use
- Catalyst for digital equity

### **RESEARCH CHALLENGES**

- Improving technology costs for capacity, indoor coverage and wide-area distribution
- Business model innovation for subscriberdensity economics
- Resource partitioning solutions for shared space deployments

### **#4:** Distributed Cloud and Communication Systems



6G will provide Distributed Cloud and Communication Systems where communications and unified computing services work together and scale across devices, network computing resources, and data centers.

#### NATIONAL IMPERATIVES

- Apply North America's expertise in cloud and software to shape the transformation to cloud-native mobile networks
- Consistent quality of service for low-latency mission critical applications and services

### **RESEARCH CHALLENGES**

- Technologies to facilitate deployment of largescale network compute fabrics
- Innovation, integration and interoperability of edge devices
- Autonomic decision-making involving distributed and federated learning

# **#5: AI Native Wireless Networks**



An AI-Native future network is needed to increase the robustness, performance, and efficiencies against more diverse traffic types, ultra-dense deployment topologies, and more challenging spectrum situations

### NATIONAL IMPERATIVES

- Shape global evolution of AI in line with North American values and, economic and security goals
- Promote critical applications of AI to maintain North American leadership in wireless communications
- Help North American consumers and workforce to capitalize on economic gains of AI/ML
   A L L I A N C E

### **RESEARCH CHALLENGES**

- Open architectures and interoperability
- Availability of datasets and AI/ML validation
- Handling of computational complexity, overhead management and minimum performance guarantees

### **#6: Sustainability**



6G systems will reduce environment impact, be more energy-efficiency, and will implement circular economy principles

### NATIONAL IMPERATIVES

- Reduce ICT sector's energy consumption and decarbonize the energy supply
- Leverage North American expertise in: component design & manufacturing, advanced data modeling & optimization, power-efficient radio technologies, and carbon-neutral data center facilities

### **RESEARCH CHALLENGES**

- Energy reduction across Radio, Core Network, Cloud and Edge compute, IoT & connected devices
- Environmental impact reduction related to raw materials, land and water use
- Use of Green Credentials and metrics to promote resource efficiency

# **Next G Alliance Lifecycle to 6G**



# **Desired Outcomes**

### NORTH AMERICAN LEADERSHIP

- Powerful work collaboration across industry, government and academia
- Robust marketplace using innovative applications and technologies that connects society in a new digital world
- Increased ownership of technology advancements that enable the 6G vision



### DISTINCTIVE ADVANCEMENTS

(a few examples)

- Multi-dimensional, multi-party and multi-sensory experiences
- AI-Native, trusted and ethical AI
- Higher Frequency (THz/Sub-THz) and multi-use spectrum
- Design for Sustainability, reduced energy, zero-energy devices
- Transform quality of life and work across healthcare, public safety, and education



Societal and Economic Needs	Applications	Requirements
<ul> <li>&gt;&gt; United Nations SDGs</li> <li>&gt;&gt; Digital equity (Affordability, Accessibility, Availability)</li> <li>&gt;&gt; Trust (Security, Resiliency)</li> <li>&gt;&gt; Sustainability</li> <li>&gt;&gt; Economic growth</li> <li>&gt;&gt; Quality of life (Healthcare, education)</li> </ul>	<ul> <li>Real time personalization</li> <li>Service Robots (Remote surgery, Transportation, Manufacturing)</li> <li>Experience</li> <li>Holographic communication</li> <li>Immersive Reality (XR,VR)</li> <li>Digital twin (Monitoring, Training)</li> <li>Drone applications (Racing)</li> <li>Critical</li> <li>Drone applications (Surveillance, Logistics)</li> <li>Public and private safety (Automated surveillance, Remote data collection &amp; sharing)</li> <li>Societal Goals</li> <li>Remote education and healthcare</li> </ul>	<ul> <li>» Ultra-reliable</li> <li>» Energy efficient</li> <li>» Edge computation</li> <li>» Localization accuracy</li> <li>» Ubiquitous coverage</li> <li>» Minimum latency</li> <li>» High data rate</li> <li>» Application-based bandwidth</li> <li>» High network security</li> </ul>
<ul> <li>» Reduced CO2, Greenhouse gas emissions         <ul> <li>(ICT goals)</li> <li>» Recycle and reuse (batteries, components)</li> <li>» Land and water resources conservation</li> <li>» Network energy savings (RAN, Core, Datacenters)</li> </ul> </li> </ul>	5 Technology Areas	

#### Spectrum

- » Spectrum management
- » Spectrum policy
- » Regulatory assessment
- >> New spectrum ranges (Thz/Sub Thz)
- >> mmW enhancements
- » Spectrum sharing
- » Spectrum efficiency techniques

» Component technologies: Silicon & III-V semiconductors, Circuits & sub-systems, Antenna and packaging advancements

» Radio Technology:

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- Spectral expansion and efficiency, Advanced MIMO, Reconfigurable intelligent surfaces, Full duplex, Channel improvement techniques
- Al & Distributed cloud: Al native air interface
- Green communications: Zero energy communications, Green network
- Joint communications and sensing: Positioning, 3D mapping
- Systems and Network Architectures: Network topologies (Non-terrestrial networks, Sidelink, Mesh networks), Distributed cloud and computing, Al in network & devices
- » Network OA&M and Service enablement: Built-in Al, Zero touch network automation, Al-based energy saving solutions
- » Trustworthiness: PHY/MAC techniques, Post-quantum cryptography, Automated closed loop security

#### Building the Foundation for North American Leadership in 6G and Beyond

# What Next?

- Continue building government relationships, working hand-in-hand early in the lifecycle
- Develop requirements and KPIs to drive research agenda and initiatives
- Engage with international partners to build industry consensus, including participation in ITU "IMT Vision for 2030 and Beyond"
- Facilitate innovation and collaboration





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