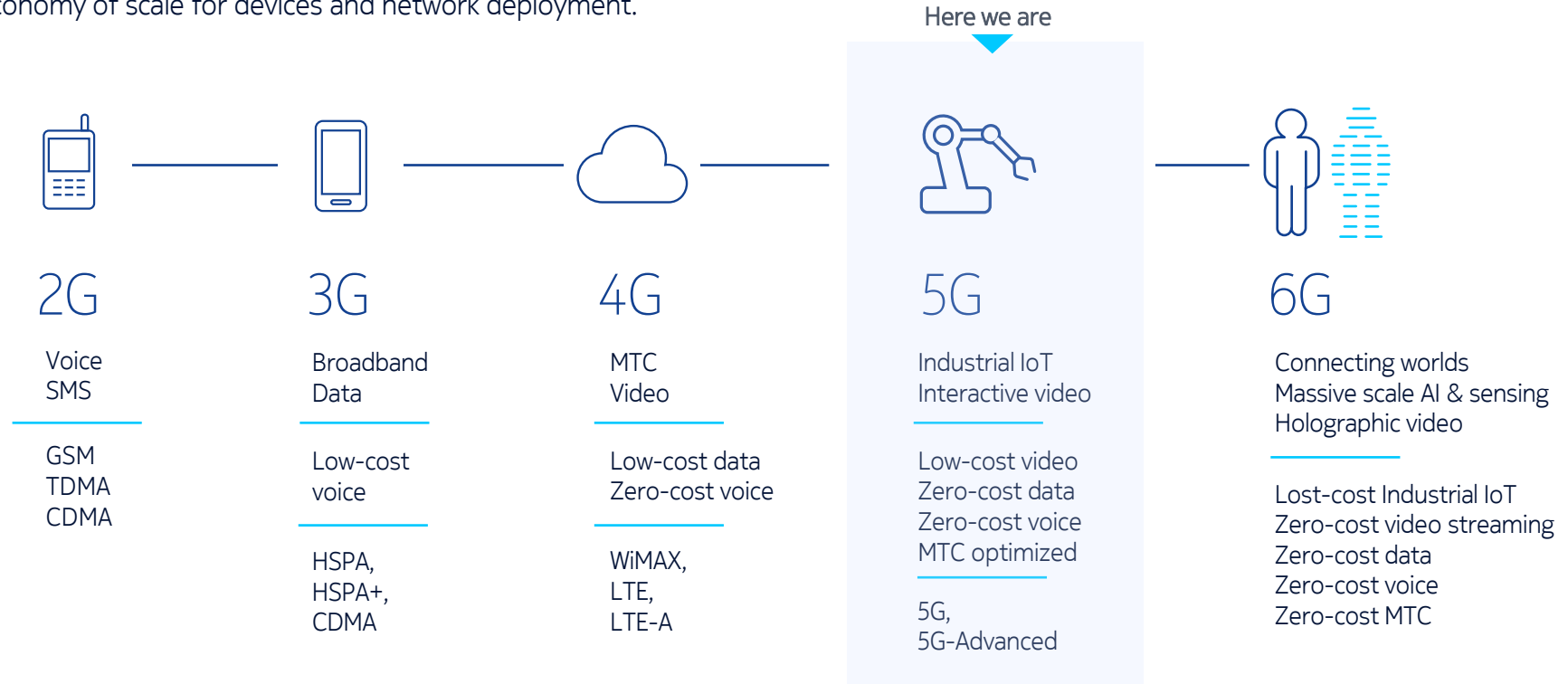# NOKIA

NextG Alliance Goals and Vision

Winn Comm 2022

Dec. 15th , 2022

Amitabha Ghosh, Nokia Fellow, Chair: NGA National Roadmap WG

Contributor's : NGA WG's LT (Applications WG, Green G WG)

Global standards is key for success of cellular technology

Global roaming support is the key to success of every G, benefits the consumer.
Economy of scale for devices and network deployment.

Here we are

2G

Voice
SMS

GSM
TDMA
CDMA

3G

Broadband
Data

Low-cost
voice

HSPA,
HSPA+,
CDMA

4G

MTC
Video

Low-cost data
Zero-cost voice

WiMAX,
LTE,
LTE-A

5G

Industrial IoT
Interactive video

Low-cost video
Zero-cost data
Zero-cost voice
MTC optimized

5G,
5G-Advanced

6G

Connecting worlds
Massive scale AI & sensing
Holographic video

Lost-cost Industrial IoT
Zero-cost video streaming
Zero-cost data
Zero-cost voice
Zero-cost MTC

Public

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5G expected to become a general-purpose technology platform

	5G	5G - Advanced	6G
Video	High quality video	XR, a fully immersive user experience while on the move	Holographic
Digital twins	Digital twin of an engine	Digital twin at a larger scale (e.g., a vertical farm)	Digital twin of cities and even humans with real-time synchronous updates
Localization & sensing	Data communication & control	Provide precise location & timing services that complement GNSS	Network with a 6th sense

Examples only

Expected 3GPP standardization timeline

Rel 15
Extreme mobile broadband

Rel 16
Ultra-reliable low latency communications

Rel 17
Wider ecosystem expansion

Rel 18
5G Advanced

Rel 19 -20
5G Advanced cont'd, 6G studies

Rel 21
6G standardization

Rel 22+
6G enhancements
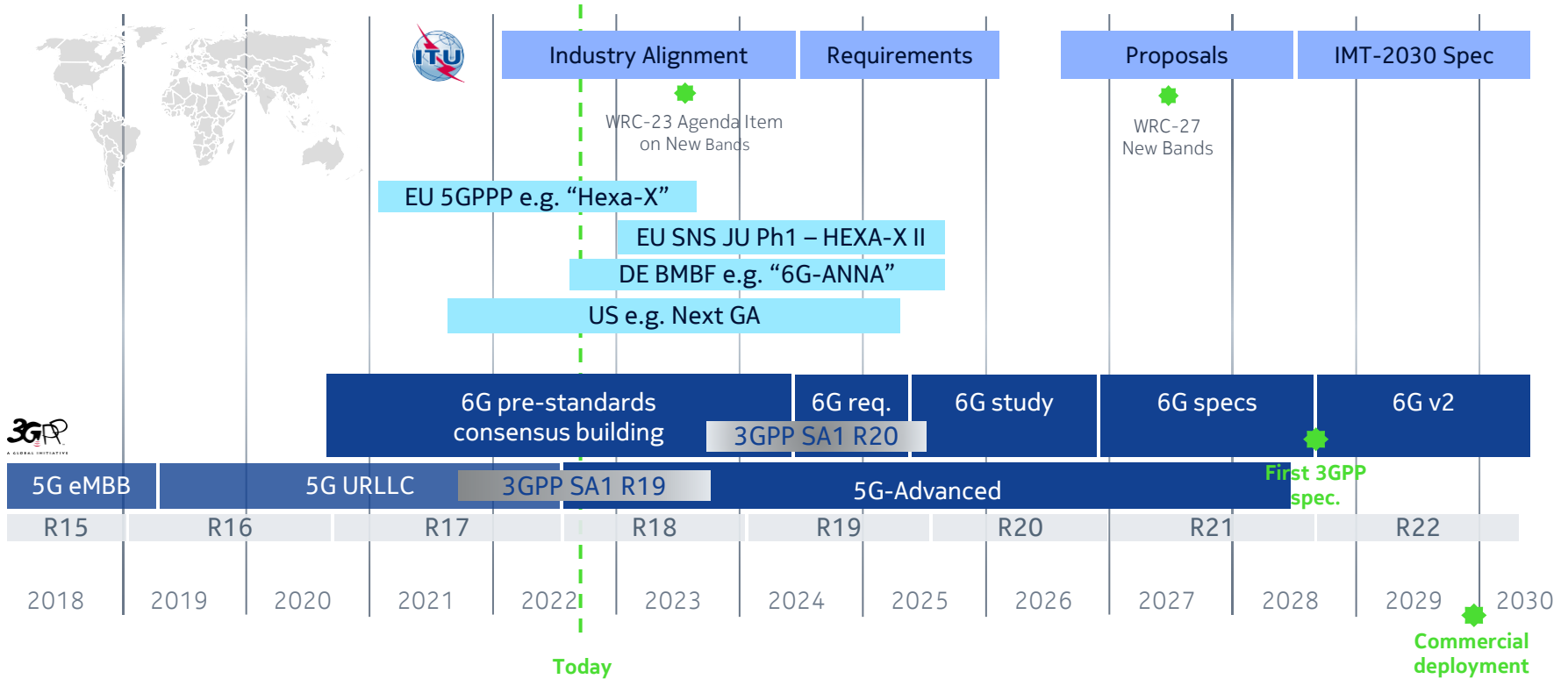
2019   2020   2022   2023-24   2025- 27   2028-29   2030+

Regulatory, innovation, standardization timelines to be brought in harmony

Regulatory

ITU

| Industry Alignment | Requirements | | Proposals | IMT-2030 Spec |

WRC-23 Agenda Item on New Bands

WRC-27 New Bands

Innovation

EU 5GPPP e.g. "Hexa-X"

EU SNS JU Ph1 – HEXA-X II

DE BMBF e.g. "6G-ANNA"

US e.g. Next GA

Standardisation

3GPP

| 6G pre-standards consensus building | 6G req. | 6G study | 6G specs | 6G v2 |

3GPP SA1 R20

First 3GPP spec.

| 5G eMBB | 5G URLLC | 3GPP SA1 R19 | 5G-Advanced |

| R15 | R16 | R17 | R18 | R19 | R20 | R21 | R22 |

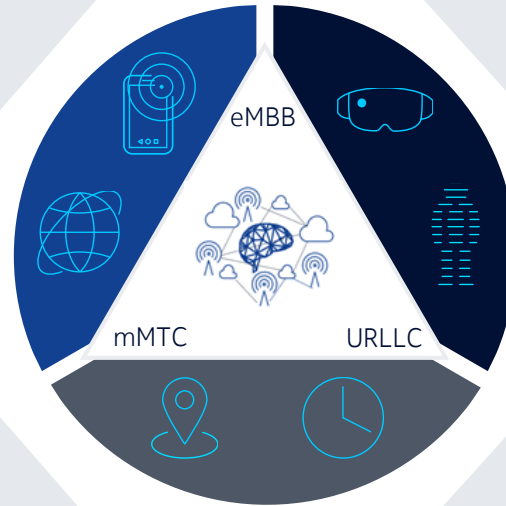| 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |

Today

Commercial deployment

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5G Advanced

Extensions

- Service coverage enhancements
- Enhanced RedCap for sensors
- Sub-5 MHz carrier for railways and smart grid
- Sidelink enhancements for vehicles, public safety, and extended reality
- 5G satellite networks
- 5G drone support

Experience

- Extended reality (XR) optimizations
- Edge computing optimizations for e.g. Cloud gaming
- Mobility performance improvements for e.g. industrial and XR use cases
- Beamforming boost

Expansions

- High accuracy and low cost positioning methods for e.g. industrial automation, IoT
- Timing & synchronization aaS e.g. for transactions and critical infrastructure

Excellence

- Network energy savings
- Slicing enhancements
- Traffic splitting & steering
- Centralized BB Unit resiliency
- AI/ML in RAN and CORE

eMBB

mMTC

URLLC

Public

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6G Regional Initiatives

North America
- NEXT G ALLIANCE
- NSF RINGS

Europe
- EU — Hexa-X · SMART NETWORKS & SERVICES
- FI — 6Genesis
- DE Other countries — *6G Hubs and Lighthouse and other national initiatives (*)*

Asia
- CN
  - MIIT
  - 中华人民共和国科学技术部 Ministry of Science and Technology of the People's Republic of China
  - 未来移动通信论坛 FUTURE MOBILE COMMUNICATION FORUM
  - 6GANA
  - CCSA
- KR
  - Ministry of Science and ICT
  - 5G Forum
  - ETRI Electronics and Telecommunications Research Institute
- JP
  - MIC Ministry of Internal Affairs and Communications
  - IOWN GLOBAL FORUM
- IN
  - tsdsi
  - DOT

Foundational Goals

Next G Alliance Agenda

Private sector and government position North America as the global leader for Next G technologies.

North American Model for Success

A comprehensive model built on the North American 6G technology developments, R&D needs, standards goals and market readiness.

6G Market Leadership

Strategies that will lead to rapid commercialization and adoption of Next G technologies across domestic and global markets.

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Founding and Full Members

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Contributing Members
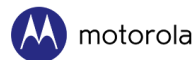
Government Members

Government Member class approved by Next G Alliance in 4Q21

Next G Alliance structure, mission and vision
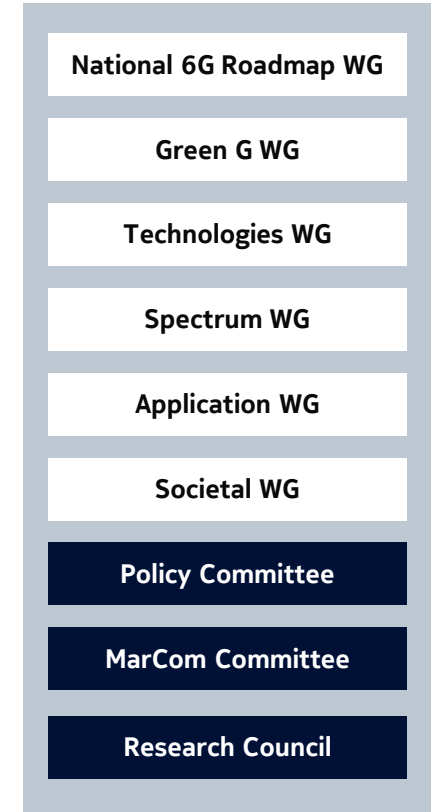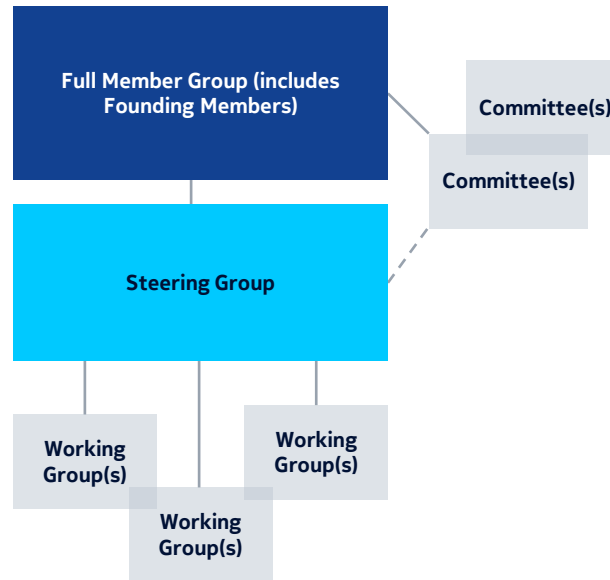
Mission

- The ATIS Next G Alliance advances North American mobile technology leadership over the next decade through private sector-led efforts.

- The work will encompass the full lifecycle of research and development, manufacturing, standardization and market readiness.

Vision

- Develop a vision, roadmap, technical direction and timeline for 6G

- Facilitate interaction with USG agencies for funding

- Provide visibility of external US and global 6G research projects in order to track the fulfillment of the research roadmap

- Research Council will drive the NGA's research agenda forward as a leadership resource within the NGA and externally through engagement in academic, governmental, and industrial research forums

Contribution-driven, pre-consensus building forum

Full Member Group (includes Founding Members)

Committee(s)

Committee(s)

Steering Group

Working Group(s)

Working Group(s)

Working Group(s)

National 6G Roadmap WG

Green G WG

Technologies WG

Spectrum WG

Application WG

Societal WG

Policy Committee

MarCom Committee

Research Council

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Lifecycle to Next G

Research

Standards Leadership

Realization

Collaborate with government on promoting domestic development and production

Align on policies, incentives and approaches that will position 6G for North American innovation

Feedback

Identify key research priorities, applications and technology development areas

Drive North American needs and goals in 6G global standardization bodies

Collectively enable 6G marketplace to meet North American economic, policy, societal and market-driven goals

Development and Manufacturing
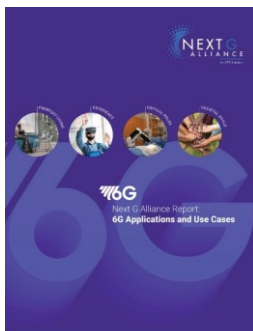
Market Readiness

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Next G Alliance Reports

The Path Toward Sustainable 6G

Roadmap to 6G

6G Applications and Use Cases

6G Technologies

6G Distributed Cloud and Communications System

6G Trust, Security and Resilience

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Roadmap to 6G

Trust, Security and Resilience | **Digital World Experiences** | **Cost Efficient Solutions** | **Distributed Cloud and Communications Systems** | **AI-Native Wireless Networks** | **Sustainability**

Societal and Economic Needs

» United Nations SDGs

» Digital equity (Affordability, Accessibility, Availability)

» Trust (Security, Resiliency)

» Sustainability

» Economic growth

» Quality of life (Healthcare, education)

Green G

» Reduced CO2, Greenhouse gas emissions (ICT goals)

» Recycle and reuse (batteries, components)

» Land and water resources conservation

» Network energy savings (RAN, Core, Datacenters)

Spectrum

» Spectrum management

» Spectrum policy

» Regulatory assessment

» New spectrum ranges (Thz/Sub Thz)

» mmW enhancements

» Spectrum sharing

» Spectrum efficiency techniques

Applications

Living
» Real time personalization
» Service Robots (Remote surgery, Transportation, Manufacturing)

Experience
» Holographic communication
» Immersive Reality (XR,VR)
» Digital twin (Monitoring, Training)
» Drone applications (Racing)

Critical
» Drone applications (Surveillance, Logistics)
» Public and private safety (Automated surveillance, Remote data collection & sharing)

Societal Goals
» Remote education and healthcare

Requirements

» Ultra-reliable
» Energy efficient
» Edge computation
» Localization accuracy
» Ubiquitous coverage
» Minimum latency
» High data rate
» Application-based bandwidth
» High network security

Technology Areas

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

» **Radio Technology:**

  ◦ Spectral expansion and efficiency, Advanced MIMO, Reconfigurable intelligent surfaces, Full duplex, Channel improvement techniques

  ◦ AI & Distributed cloud: AI 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, AI in network & devices

» **Network OA&M and Service enablement:** Built-in AI, Zero touch network automation, AI-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

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NEXT G ALLIANCE
an ATIS initiative

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

February 2022

- Launch of report on "*Roadmap to 6G*"

- Foundation for North American 6G Vision and Leadership

- Broad ecosystem of Next G Alliance contributors

Next G Alliance Membership

82
64
46
41
15

Operators
Vendors
Hyperscalars
Academia
Government
Research Labs

600 experts across 82 members

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Six Audacious Goals and 6G Applications

- NGA's Six Audacious Goals

- How are they (being) addressed next?

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Applications that affect all aspects of life, society, and industries

Everyday Living

Service robots for home assistance

Indoor/outdoor delivery services

Intelligent travel assistance

Experience

Real-time interactive gaming

MR entertainment

MR-powered classrooms

XR-enriched transportation

Critical Roles

Digital twins

Robotics for hazardous conditions

Remote surgery, therapy & monitoring

Manufacturing & agriculture

Societal Goals

Digital equity

Cultural and civic participation

Public safety

Sustainable society

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Delivering Powerful 6G Applications that will Drive Future Innovation

#1 Multi-Sensory Extended Reality

- Ultra-realistic interactive sports
- Immersive gaming and entertainment
- MR co-design
- MR telepresence
- Immersive education
- High-speed connectivity to aerial vehicles

#2 Distributed Sensing and Computing

- Remote data collection
- Untethered wearables and implants
- Eliminate digital divide
- Public safety applications
- Synchronous data channels for sensors
- In-body networks for healthcare

#3 Network Enabled Robotics and Autonomous Systems

- Online cooperative operation among a group of service robots
- Field robots for hazardous environments
- Robot sensing systems
- Other critical role needs

#4 Personalized User Experience

- Personalized travel and leisure experiences
- Personalized shopping experiences
- Personalized education learning experiences
- User-oriented security and privacy management
- Situational context

#1 Multi-Sensory Extended Reality (XR)

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

1) Ultra-realistic interactive sports
2) Immersive gaming/entertainment
3) Digital Twins
4) MR co-design
5) MR telepresence
6) Immersive education
7) High-speed connectivity to aerial vehicles

User interface depends on high-fidelity pictures (8K, 16K, 3D displays) e.g., holographic imaging, and ultra-sensitive and responsive interactions between the user and controlled objects.

#2 Distributed Sensing and Communications

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

1) Remote data collection
2) Untethered wearables and implants
3) Addressing quality, availability, and adoption to eliminate digital divide
4) Public safety applications
5) Synchronous data channels for sensors
6) In-body networks for health care

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

#3 Network Enabled Robotics and Autonomous Systems

Network enabled and connected systems perceive their surroundings using sensors such as GPS, light detection and ranging, sonar, radar, camera, and odometry. Includes cooperative service robots and field robots.

1) Online cooperative operation among a group of service robots
2) Field robots for hazardous environments
3) Robot sensing systems
4) Other critical role needs

Enabling robotic and autonomous systems to interact with humans in natural ways and to make decisions necessary to assist or support a set of tasks utilizing communication services.
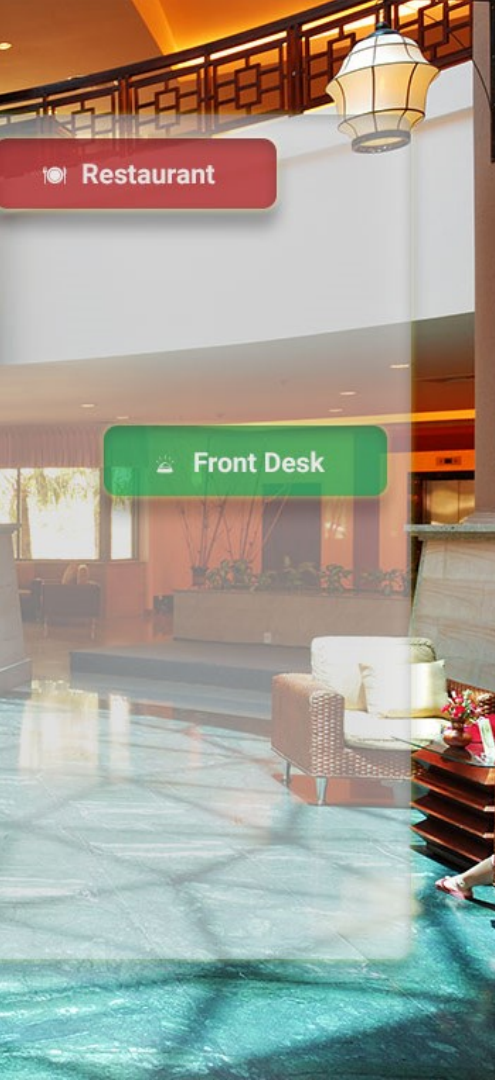
#4 Personalized User Experience

Real-time, fully automated, and secure personalization of devices, networks, products, and services for applications such as shopping, air travel, education and learning.

1) Personalized leisure and travel experiences
2) Personalized shopping experiences
3) Personalized learning education experiences
4) Management of user-oriented security and privacy
5) Situational context of user to deliver personalized user experience (UX)

Automating real/pseudo-real time secure personalization of applications based on user's profile and situational context.

What services do we expect from 6G?

| Use Case (capability)	5G	6G	
Augmented Reality for Industry (peak rate & capacity)	Low resolution / high level tasks	High resolution, multi-sensory/detailed tasks, co-design	Enhancement to 5G services
Telepresence (capacity)	High video quality, limited scale	Mixed reality/Holographic	
Security surveillance, Defect detection (positioning & sensing)	Manual	Automated	
Distributed computing, Automation (time synchronization)	Micro-seconds level tasks	Higher precision nano second level tasks	
Dynamic digital twins and virtual worlds (real-time multi-sensory mapping and rendering)	No	Yes	New services introduced in 6G
Wireless in Data Center (peak rate and capacity)	No	Yes	
Zero Energy devices (back scatter communications)	No	Yes	
Swarms of robots or drones (low latency D2D)	May be	Yes	
Bio sensors and AI	Limited	Yes	

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The enabling foundation for that future…

Ubiquitous compute

Precision sensing & actuation

Digital World

6G

Physical World
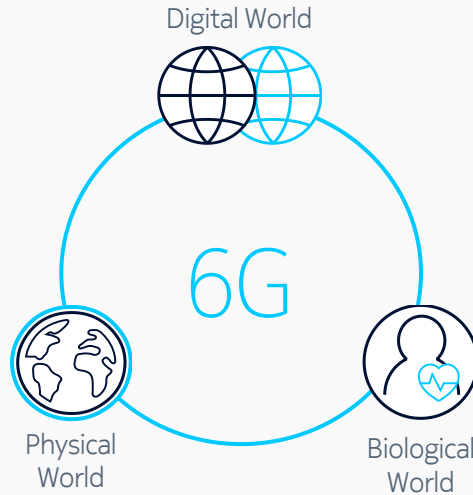
Biological World

Knowledge systems

Human machine interface

6G will unify the experience across physical, digital and biological worlds

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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

National Imperatives

Applications and Markets

Technology Development

Trust, Security and Resilience

Digital World Experiences

Sustainability

NEXT G ALLIANCE
Audacious Goals

Cost Efficient Solutions

AI-native Wireless Networks

Distributed Cloud and Communications Systems

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#1: Trust, Security and Resilience

The 6G system will be trusted by people, businesses, and governments to be resilient, 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 human-human, 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**
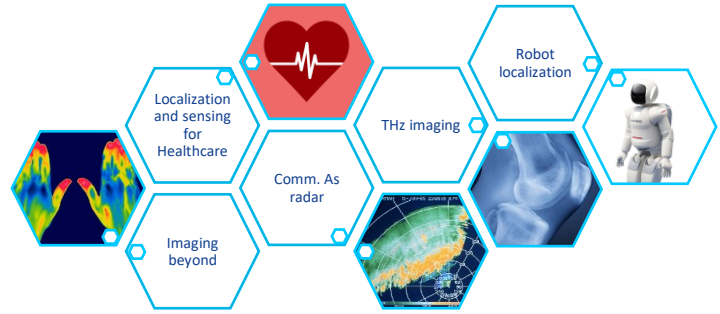
RESEARCH CHALLENGES

- **Innovation in cyber-physical technologies, going beyond sight and sound**

- **Knowledge systems and extreme automation**

- **Open and interoperable standards across application and technology domains**

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6G network with a 6th sense
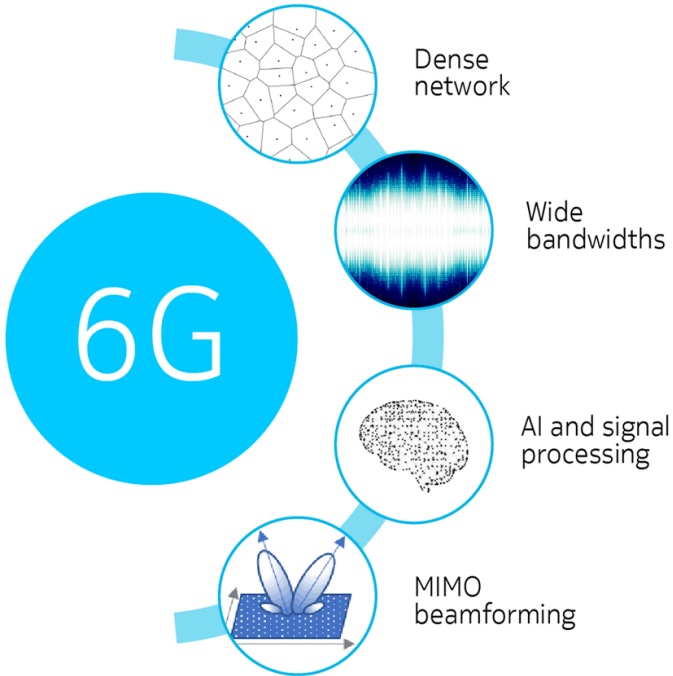
Simultaneous communication and sensing

- Waveform multiplexing
- Resource allocation
- Beam sweeping
- CSI based sensing
- High precision localization in NLOS

Dense network

Wide bandwidths

AI and signal processing

MIMO beamforming

6G

Localization and sensing for Healthcare

Robot localization

THz imaging

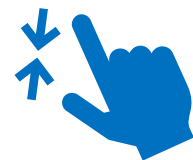Comm. As radar

Imaging beyond

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6G extreme networks

The end-point is a network for life-critical communication

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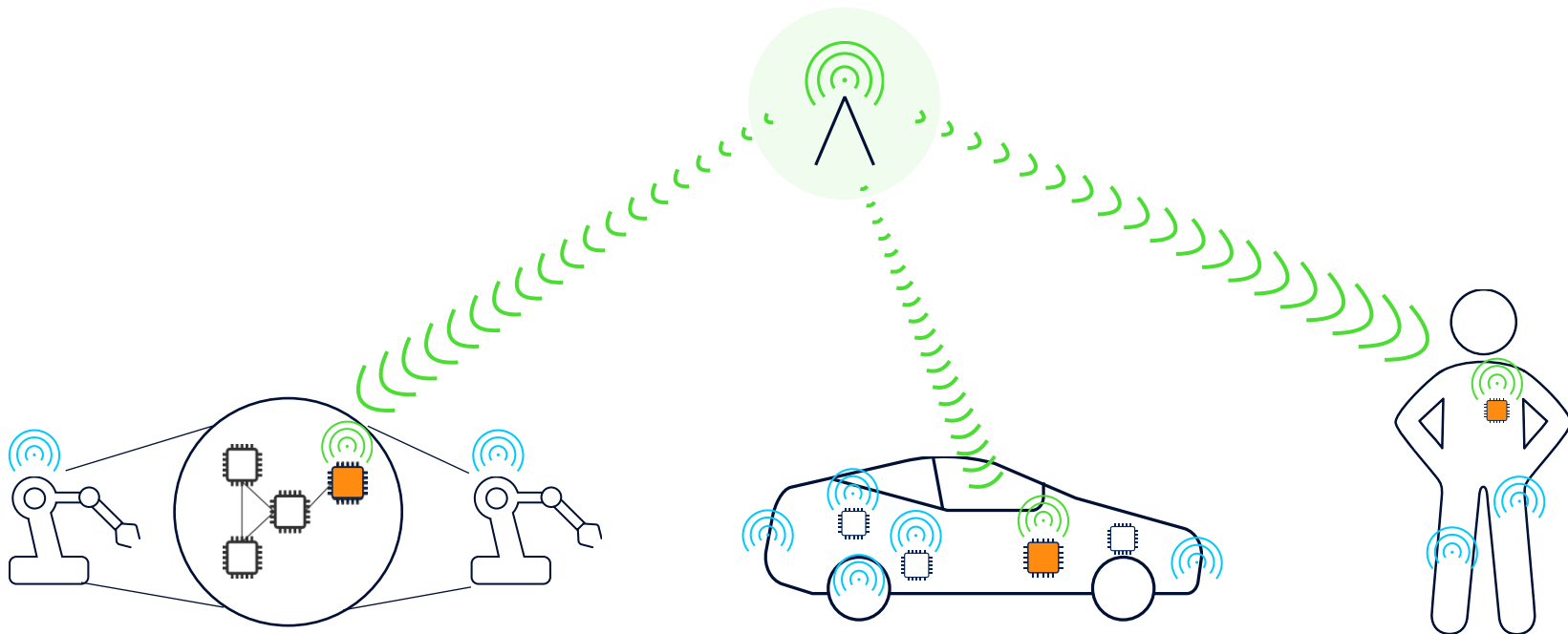
#3: Cost Efficiency

Cost 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	RESEARCH CHALLENGES

- **Affordable access to services essential to American lives**

- **Policies addressing rural availability, infrastructure efficiencies and spectrum use**

- **Catalyst for digital equity**

- **Improving technology costs for capacity, indoor coverage and wide-area distribution**

- **Business model innovation for subscriber-density economics**

- **Resource partitioning solutions for shared space deployments**

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Cost-efficient high-throughput solutions

01 Urban Capacity, Coverage

Densification, Performance, Spectrum, Sharing

03 Indoor Coverage

Bridging capacity indoors @ mmWave and above

02 Rural Coverage

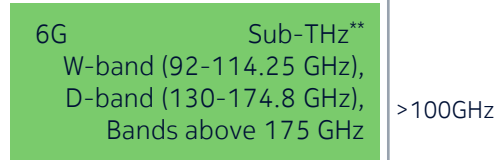Range, Distribution, Satellite, HAPs, Drones.

04 Energy Efficiency
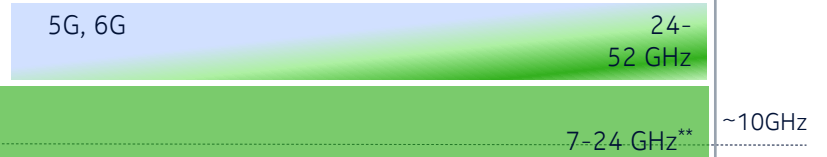
Native AI, Efficient PAs, Low-bit ADC

NEXT G
ALLIANCE

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Bands for 5G and ranges explored for 6G

Peak capacity layers

6G   Sub-THz**
W-band (92-114.25 GHz),
D-band (130-174.8 GHz),
Bands above 175 GHz

>100GHz

Localized high capacity

5G, 6G   57-71 GHz
(unlicensed)

5G, 6G   24-52 GHz

Capacity enhancement layers

5GEvol, 6G   ~10GHz

7-24 GHz**

Basic capacity layers

5G, 6G   4.4-5 GHz, 6.425-7.125 GHz*

5G, 6G   3.3-4.2 GHz
(licensed/shared)

5G, refarming to 6G   1.5, 1.8, 2.1, 2.3(shared), 2.6 GHz

Basic coverage layers

5G, refarming to 6G   470-694MHz)*, 600, 700, 800, 900 MHz   <1GHz
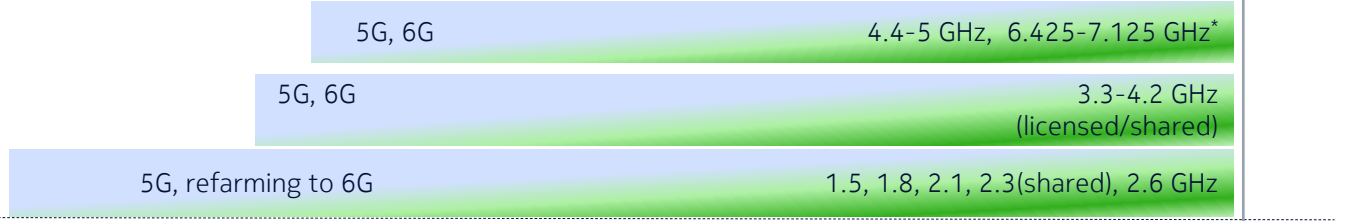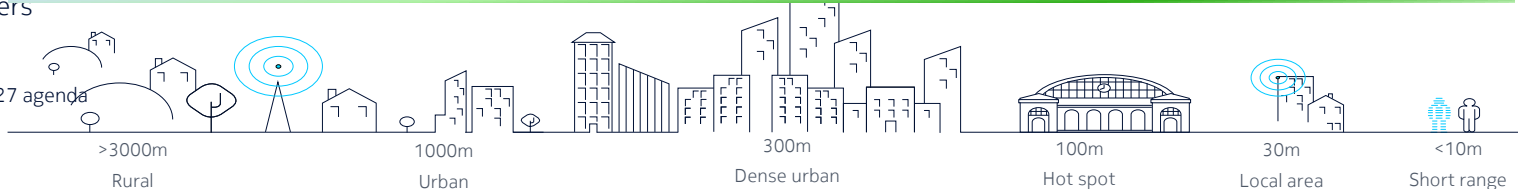
* Discussed in WRC-23
** potential band in WRC-27 agenda

>3000m	1000m	300m	100m	30m	<10m
Rural	Urban	Dense urban	Hot spot	Local area	Short range

Public

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#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 large-scale network compute fabrics

- Innovation, integration and interoperability of edge devices

- Autonomic decision-making involving distributed and federated learning

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6G Architecture goals

Simplification

Minimize functions
CI/CD delivery model
Automation

Cloud Platform

Public/private/hybrid
Premises/edge/metro
Containerization/serverless

Flexibility

Function placement
Peer-to-peer and sub-networks
Slicing

Programmability

Micro-services
Service based interfaces
Cloud agnostic

Scale

Global/local
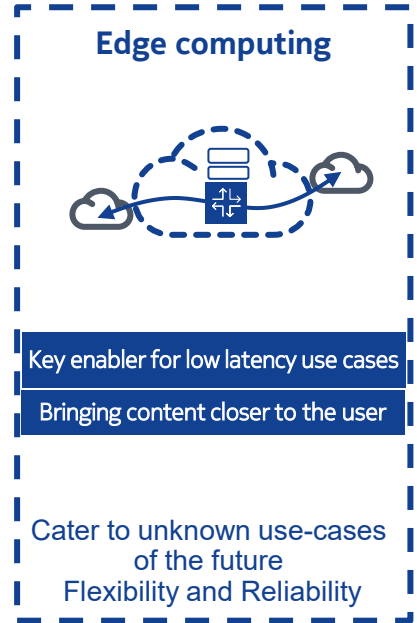> 100 Gbps / cell
< 0.5 ms latency

Robustness & Security

Truly anywhere
Multi-connected

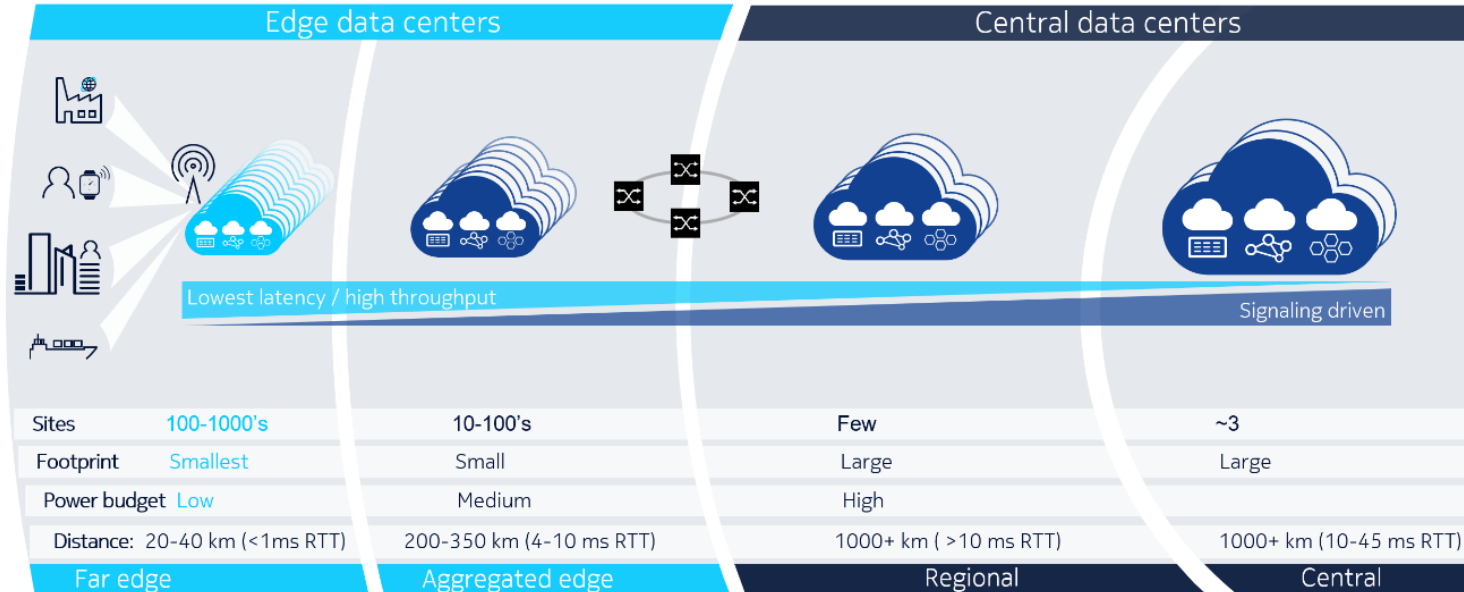**NOKIA**

Edge computing in 6G

Challenges and opportunities

- **Why?**
  - **Enable new applications or enhance user experience** for existing apps through **lower latency**: AR/VR, IIoT, video analytics, C-V2X, mobile gaming, etc.
  - **Optimized backhaul**

- **Challenges and opportunities**
  - Market **demand** driven by new applications
  - On the **supply side:**
    - Viable opportunity for MNOs and cloud providers **to generate new revenue streams**
    - MNOs own the points of presence allowing time to market deployments

- **Cloud computing existed for some time, why deploying cloud at the edge makes things any different?**
  - **Discovery** of, and optimal (re)-routing
  - **Service continuity** for stateful apps to deal with mobility or edge cloud resources constraints
  - **Access to network services** to enhance the user experience
  - **Federation** across MNOs

Edge computing

Key enabler for low latency use cases

Bringing content closer to the user

Cater to unknown use-cases of the future
Flexibility and Reliability

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Distributed Data Centers

Distributed data centers
Edge data centers - what do we mean?

	Edge data centers		Central data centers	
			Lowest latency / high throughput → Signaling driven	
Sites	100-1000's	10-100's	Few	~3
Footprint	Smallest	Small	Large	Large
Power budget	Low	Medium	High	
Distance:	20-40 km (<1ms RTT)	200-350 km (4-10 ms RTT)	1000+ km (>10 ms RTT)	1000+ km (10-45 ms RTT)
	Far edge	Aggregated edge	Regional	Central

Nokia internal use

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#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
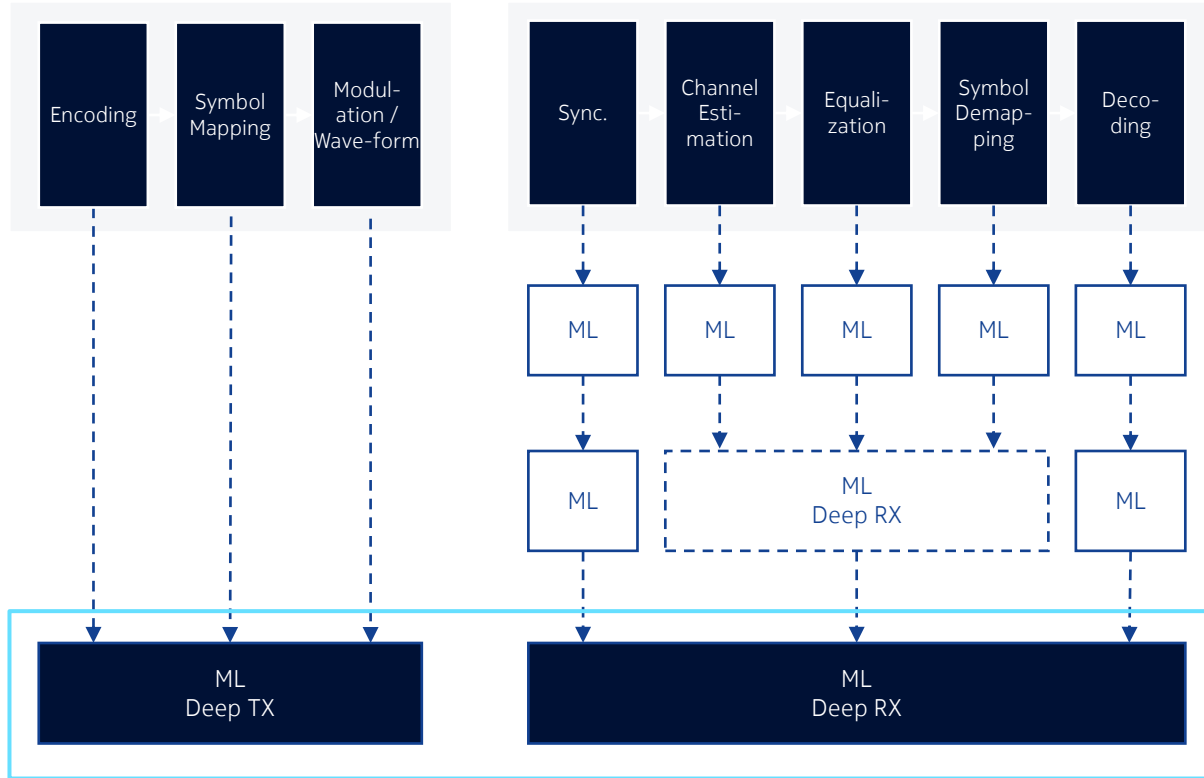
NATIONAL IMPERATIVES

- **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**

RESEARCH CHALLENGES

- **Open architectures and interoperability**

- **Availability of datasets and AI/ML validation**

- **Handling of computational complexity, overhead management and minimum performance guarantees**

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Roadmap to optimized 6G AI native air interface

Transmitter

| Encoding | Symbol Mapping | Modul-ation / Wave-form | | Sync. | Channel Esti-mation | Equali-zation | Symbol Demap-ping | Deco-ding |

5G
The classical architecture

ML · ML · ML · ML · ML

5G-Advanced
ML replaces/enhances individual processing blocks

ML · ML Deep RX · ML

5G-Advanced
ML replaces multiple processing blocks

ML Deep TX · ML Deep RX

6G
ML designs part of the PHY itself

#6: Sustainability

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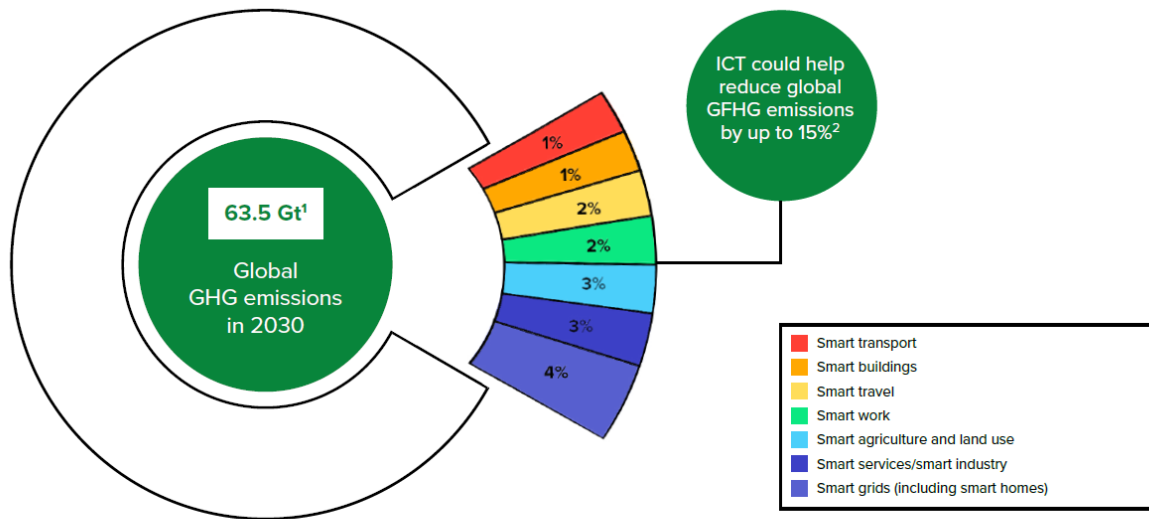
NATIONAL IMPERATIVES	RESEARCH CHALLENGES

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 Radios, Core Network, Cloud, and Edge**

- **Environment Impact Reduction through use of land and water resources**

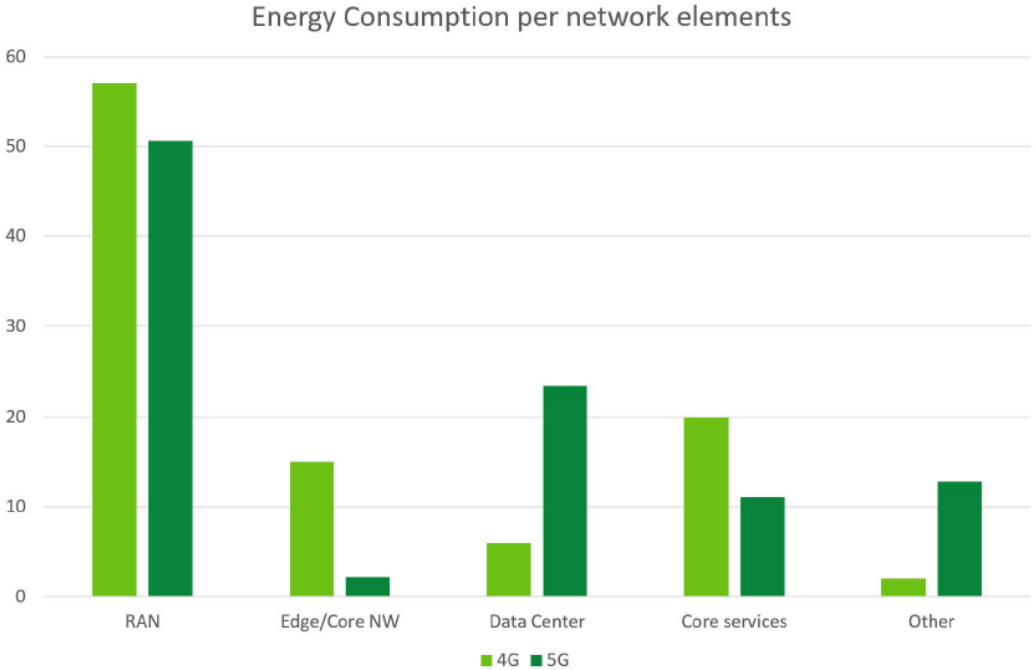- **Use of Green Credentials and metrics to promote resource efficiency**

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ICT sector can have a massive impact on decarbonization

ICT could help reduce global GFHG emissions by up to 15%[2]

63.5 Gt[1]

Global GHG emissions in 2030

1%
1%
2%
2%
3%
3%
4%

- ■ Smart transport
- ■ Smart buildings
- ■ Smart travel
- ■ Smart work
- ■ Smart agriculture and land use
- ■ Smart services/smart industry
- ■ Smart grids (including smart homes)

[1] Malmodin, J. and Bergmark, P. (2015), Exploring the effect of ICT solutions on GHG emissions in 2030, Proceedings for ICT for Sustainability Conference
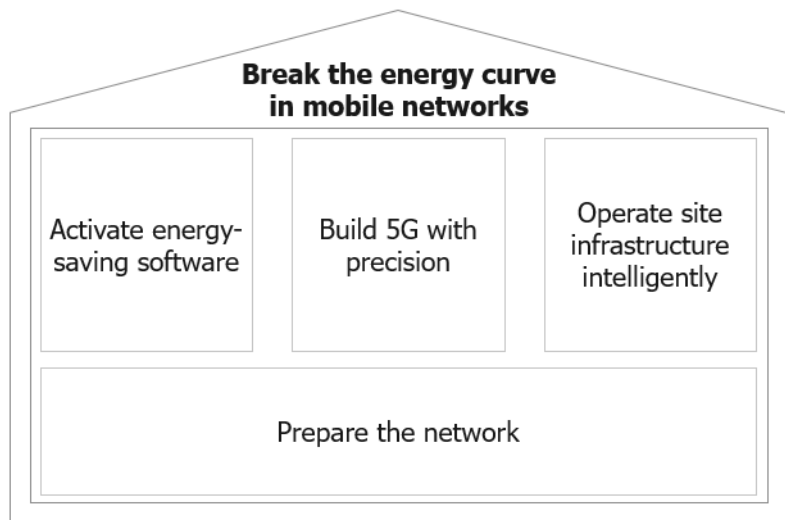[2] In a high reduction scenario based on the broad application of ICT in other sectors to drive efficiency and transformation. The sum of the individual sectors is around 16 percent, whilst double counting effects have been removed for the aggregated total of around 15 percent.

Breakdown of energy consumption in mobile network

Energy Consumption per network elements

4G ■ 5G

Source: Green G: The Path Toward Sustainable 6G

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Holistic Approach Required for Securing Network Energy and Sustainability Performance

Break the energy curve in mobile networks

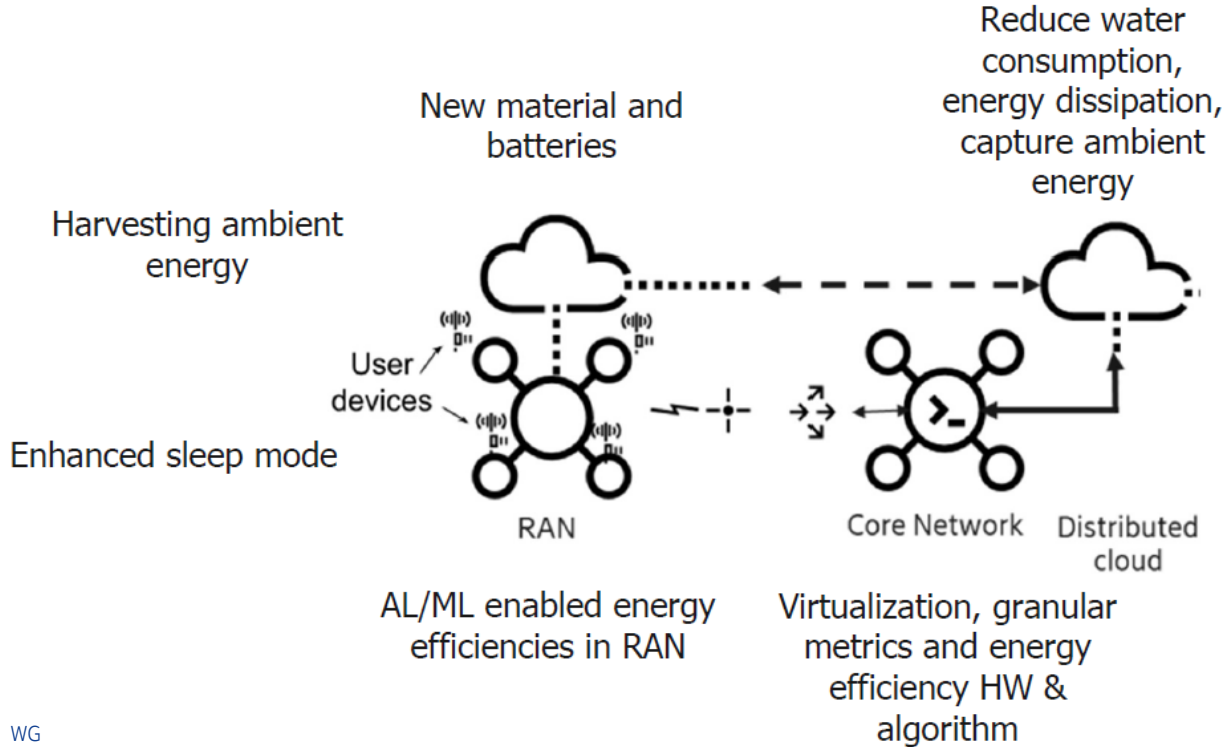| Activate energy-saving software	Build 5G with precision	Operate site infrastructure intelligently

Prepare the network

Benefits for service providers

Manage traffic growth

Reduce costs

Be a technology leader

Reduce environmental footprint

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Act on the Entire Network

New material and batteries

Reduce water consumption, energy dissipation, capture ambient energy

Harvesting ambient energy

More research
- Design optimization
- Sustainable materials
- Resource efficiency
- Waste/recycling

User devices

Enhanced sleep mode

RAN

Core Network

Distributed cloud

AL/ML enabled energy efficiencies in RAN

Virtualization, granular metrics and energy efficiency HW & algorithm

Key Research Areas

SEN

5 Groups of Outcomes

*Digital equity, Trust, Sustainability, Economic growth, and Quality of life*

Green G

3 Key Priorities

Reduced CO2 and GHG emissions, Better use/e-use of raw and rare materials, Better use of land and water resources

Technology

5 Keys Technology Areas

Component technologies, OA&M and SE, Radio technologies, System and network architectures (SNA), Trustworthiness

Applications
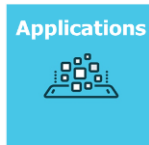
4 Foundational Areas of Improvement

Quality of everyday living, Addressing societal goals, Quality of mission critical services, Quality of user experience

Spectrum

3 Key Priorities

6G KPIs to drives assessment of spectrum characteristics, Management and access mechanisms, Policy and license model changes
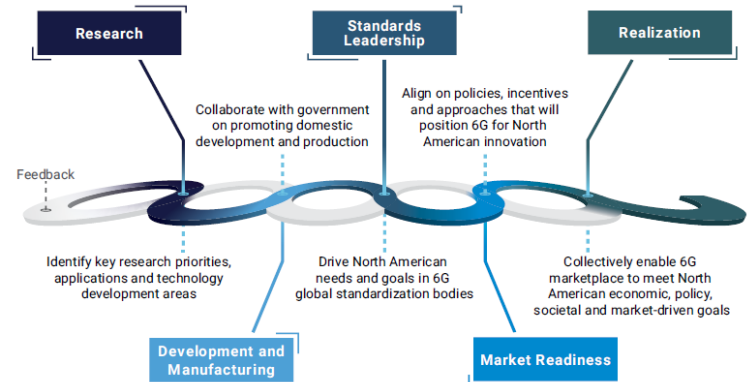
NEXT G ALLIANCE

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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" and Global Conferences

- Facilitate innovation and partnering environment among NGA Roadmap members
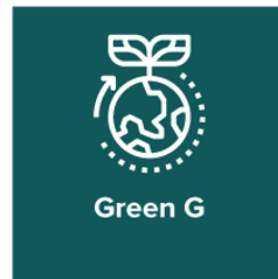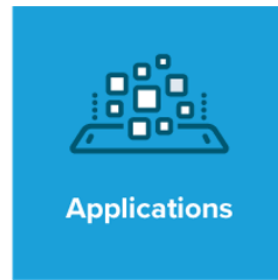
Evolution Path for NextGA Deliverables

- **Next G Alliance is seen as a very successful endeavor on 6G**
  - Laying the NAM vision for the future from a broad ecosystem of contributors
  - Collaboration amongst Industrial, Government and Academic Partners
  - Publications of key reports and whitepapers by different WGs
  - Contribution towards 6G vision to ITU
  - Lectures by renowned speakers from academia and industry on 6G technologies
  - Participation in many 6G industry events, symposiums and summits
  - Hosting NGA events and webinars (Roadmap launch, Green G)

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Next G Alliance Lifecycle Approach

Federal Government Stakeholders

⟷

Next G Alliance

Industry, Government, Academia

Strategy, Objectives, Priorities, Research Funding Recommendations

Public/Private collaboration and alignment on 6G research priorities, targeted funding, policies and incentivized actions to meet common goal of North American leadership

6G Research Initiatives

- Broad coalition of industry and academic research
- Applied research aligned with North American leadership goals
- Funding priorities driving research topics
- Program management of solicitation and awards
- Research outcomes applied to subsequent stages

Development & Manufacturing

- Onshore manufacturing incentives
- R&D tax credits
- Start-up incentives
- Secure supply chain
- Prototype testing

Standards Leadership

- Coordination of regional positions
- Advancement of regional needs
- Security requirements
- International coordination
- Regional initiatives (when needed)

"Next G" Readiness

- Market-ready spectrum policies
- Federal/local coordination on build policies
- Innovation zones
- Incentives for rural deployments

Realization & Commercialization

- Incentivized policies
- Market trials
- Training future workforce
  - Skill sets
  - Jobs of the future
- Consumer education

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 across innovative applications, societal needs, economic goals, government actions and technology developments