6G Made In USA

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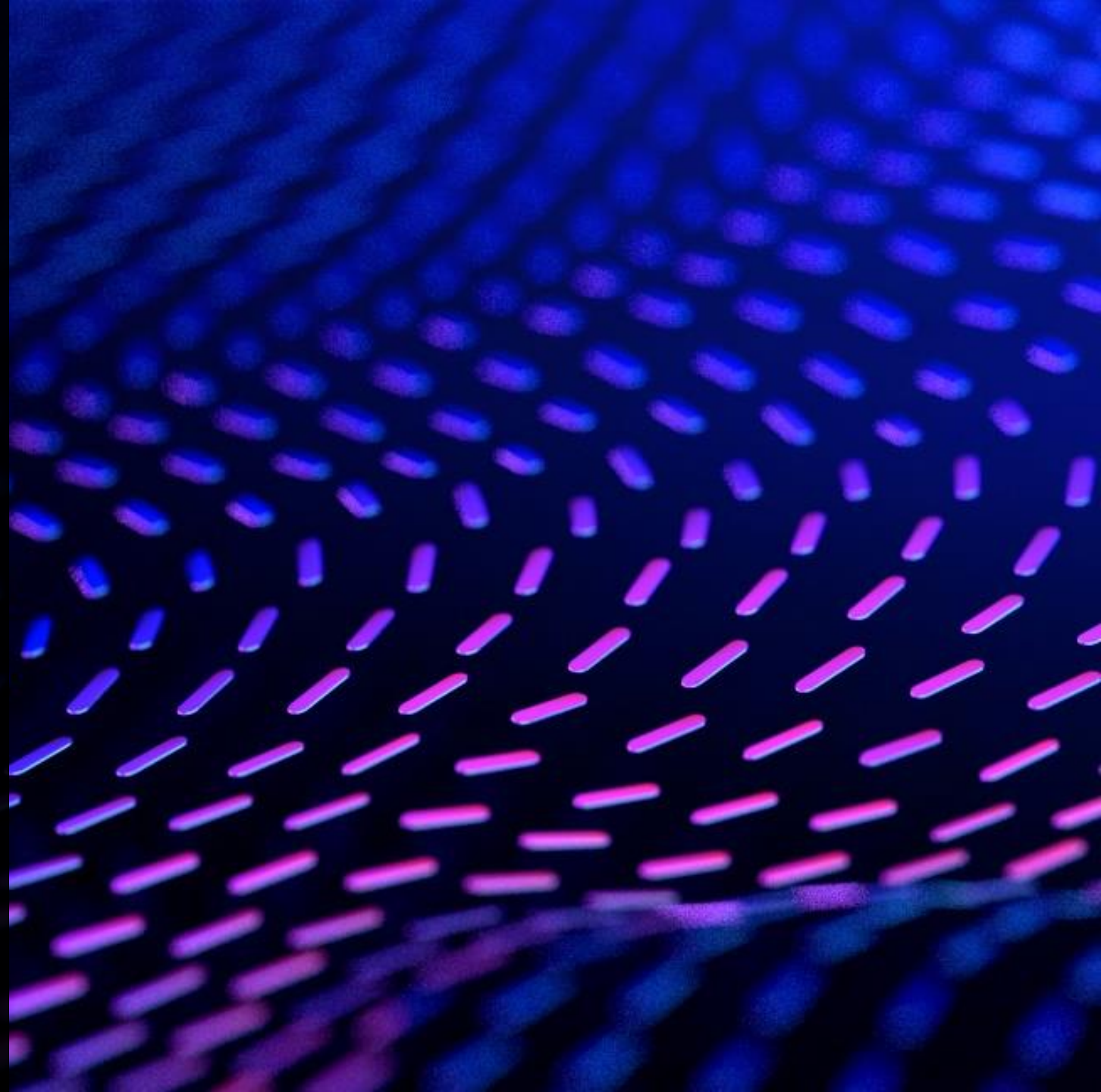


Complex US Stakeholder Ecosystem

Government

- Spectrum, Net Neutrality
- Cybersecurity, Supply Chain, AI
- International (eg US-EU TTC)

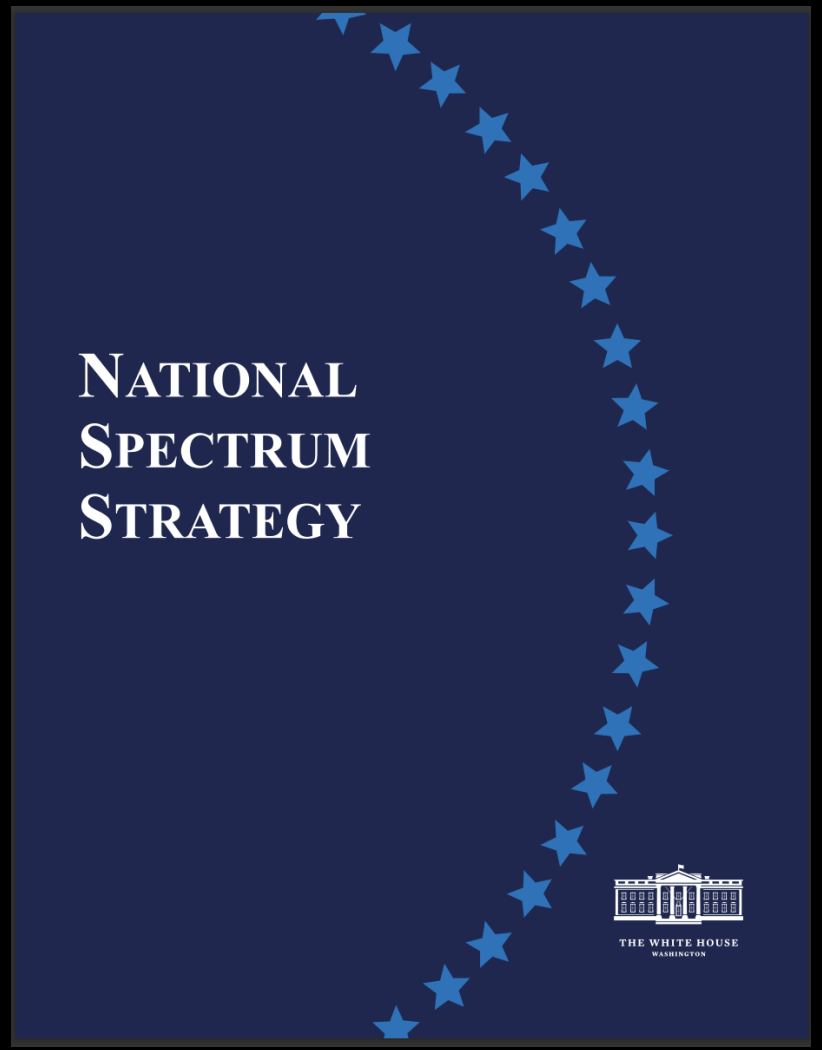
Academia

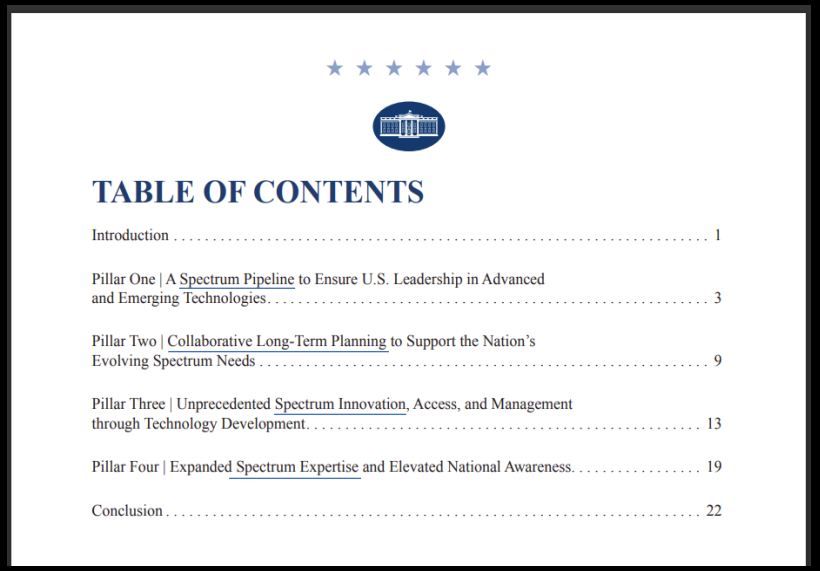
- NSF Programs, TIP
- RINGS, FuSE, etc
- Bespoke 6G Activities

Industry

- Standards (eg NGA ATIS)
- Alliances (eg O-RAN)
- Individual Corporate efforts

Government – Spectrum Strategy





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NTIA, in *collaboration* with the FCC and in *coordination* with other Federal agencies, will prepare and publish an Implementation Plan that establishes specific outcomes associated with each strategic objective. [...] Agencies will *collaborate* to develop necessary project management plans as appropriate.

US National Spectrum Strategy (NSS):

- *Ongoing studies*: 5 GHz, 12 GHz, 42 GHz, 60 GHz
- *Near-term studies*: 2.79GHz in 5 bands for gov & commercial use (3.1-3.45 GHz, 5030-5091 MHz, 7125-8400 MHz, 18.1-18.6 GHz, 37.0-37.6 GHz)

US WRC 2023 Submission:

- 3.1–3.3 GHz
- 12.7–13.25 GHz

Other Developments:

- Receiver Standards

Government – Cyber, AI, Supply & International

Principles for 6G: OPEN & RESILIENT BY DESIGN
White House National Security Council
April 21, 2023

Wireless connectivity can bridge the digital divide by expanding internet access both domestically and internationally, driving applications across our societies in areas like health, energy, transportation, and agriculture. 6G will be deployed in the next 10 years. The United States, and our allies and partners, must shape the future of this critical technology to advance economic and national security interests. Given that 6G-focused R&D is active, we have an opportunity to shape the principles that will guide the development of 6G. We must ensure that the 6G environment is technology-neutral and globally competitive, with diverse and resilient supply chains; widely available to developing nations; and relies on technical standards which align with our values. This will require collaboration between the U.S. government, its allies and partners, academia, industry, and civil society. During a full-day workshop in which stakeholders from all these groups participated, the following principles for 6G were identified.

1. Trusted Technology and Protective of National Security → Trusted
- Wireless communications systems that are produced by trusted vendors and part of a trusted communications ecosystem, facilitating the ability of the U.S. and its allies and partners to protect national security.

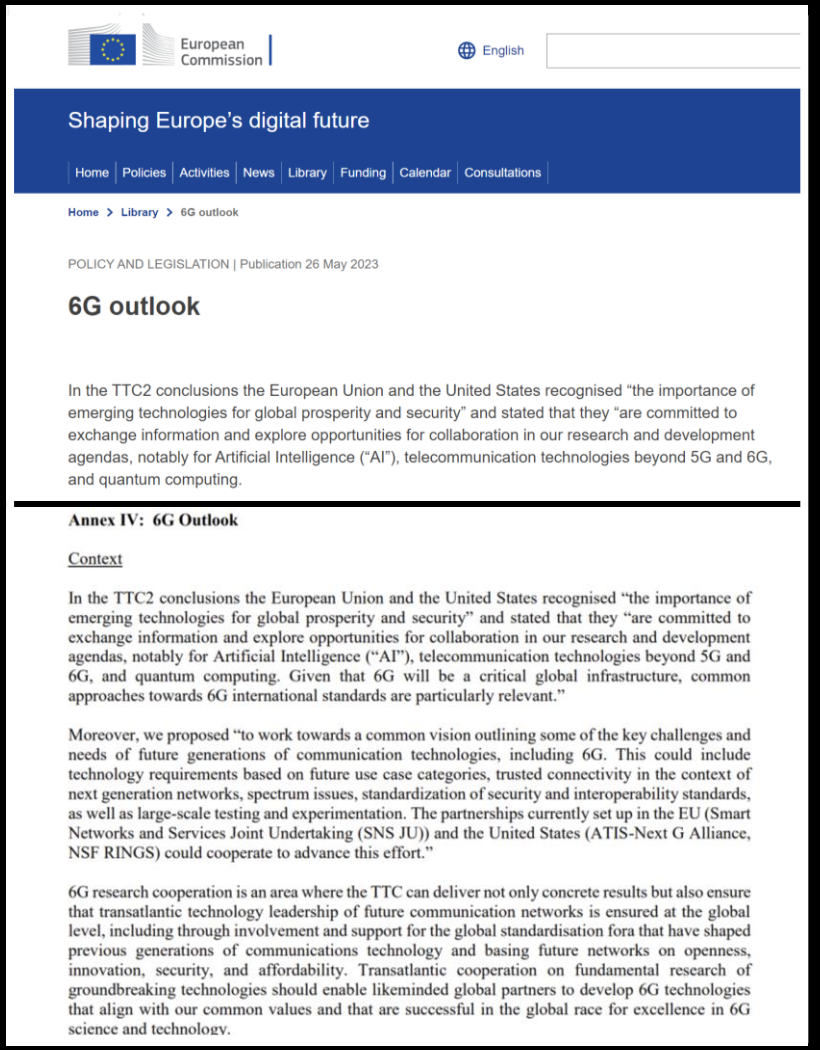
2. Open and Interoperable Innovation → Open
- Wireless communication systems that are open, interoperable, and preferably virtualized and software-defined.

3. Secure, Resilient, and Protective of Privacy → Secure
- Wireless communication systems that have systematic approaches to cybersecurity, including security-by-design, availability of essential services, and systems designed to fail safely and recover quickly.
- Wireless communications systems that are reliable, resilient, and protect the privacy of users.

4. Affordable, Environmentally Sustainable, and Globally Connected
- Wireless communication systems that are affordable, accessible, and able to bridge domestic digital divides.
- Wireless communication systems that are energy efficient, generate less pollution, and have a reduced environmental impact.
- Wireless communication systems that are widely available to developing nations.

5. Spectrum, Novel Materials, Manufacturing
- Wireless communication systems that have resilient supply chains.
- Wireless communication systems that yield a globally competitive market with multiple competing vendors.
- Wireless communication systems that have access to licensed, unlicensed, and shared spectrum.
- Wireless communications systems that efficiently make use of frequencies, are dynamic and able to effectively share spectrum, and are resistant to interference.

6. Standards & International Collaborations
- International standards that promote interoperability, competitiveness, openness, security, consensus-based decision-making, transparency, and include essential patents.
- Like-minded partners and allies that foster and promote research, development, testing, and evaluation of new technologies to advance 6G.



Government – CHIPS Act Funding $52bn

"The CHIPS and Science Act will boost American semiconductor research, development, and production, ensuring U.S. leadership in the technology that forms the foundation of everything from automobiles to household appliances to defense systems. America invented the semiconductor, but today produces about 10 percent of the world's supply[…]" from The White House

$52bn CHIPS & Science Act:

- $39bn Domestic Manufacturing Initiatives (DoC)
- $11bn R&D & Workforce Development Incentives (DoC)
- **$2bn Microelectronics Commons (DoD)**
- $1.5bn Innovation in wireless supply chains (DoC NTIA)
- $0.5bn Certain International Efforts (DoSt)
- $0.1bn Workforce and Education (NSF)

DOD Names 8 Locations to Serve as New 'Microelectronics Commons' Hubs

Sept. 20, 2023 | By C. Todd Lopez , DOD News |

Under the CHIPS and Science Act, the Defense Department today announced the award of nearly $240 million dollars to eight regional "innovation hubs" around the United States which will be a part of the Microelectronics Commons, and which will benefit both the department and the United States by spurring development of a domestic microelectronics manufacturing industry.

Academia – Major US PPP Initiatives

5G System R&D → 5G & 6G Spectrum Fundamentals → 6G Fundamental R&D

(ii) NSF PAWR

(Platforms for Advanced Wireless Research)

- $100 million public-private partnership to deploy and manage 4 city-scale research testbeds.
- PAWR is funded by NSF and a wireless Industry Consortium of 30 companies and associations.
- R&D of wireless technologies; 4 platforms (ARA, PAWR, etc) + 2 testing facilities (Colosseum, OpenAirX-Labs)
- *Ericsson made donations*

https://advancedwireless.org/

(i) NSF SpectrumX

(Spectrum Innovation Center)

- $25 million over 5 years
- Coalition of 29 institutions led by Notre Dame
- Nicholas Laneman director
- Part of the Spectrum Innovation Initiative, a collaboration between NSF, NTIA and FCC
- "to promote dynamic and agile spectrum utilization while ensuring innovation and security for all users"
- *Ericsson is on Advisory Board*

https://www.spectrumx.org/

(iii) NSF RINGS

(Resil. & Intell. NextG Systems)

- *See next slide*

(v) SRC JUMP

(Joint Uni Microelectr. Program)

- E.g. ComSenTer: 140/220/300 GHz MU-MIMO 6G Testbed; custom CMOS transceivers

(iv) SRC JUMP 2.0

(Joint Uni Microelectr. Program)

- 7 centers: "high-risk, high-payoff on communication tech technologies"; eg CUBIC

Academia – NSF RINGS

- **RINGS**: Resilient & Intelligent NextG Systems
  - Total funding $40M
  - 3-year program
  - 41 projects (distributed to 28 universities)

- **Setup**
  - Academia-industrial collaboration
  - Workshop (both physical and virtual)
  - Virtual poster sessions
  - Project-specific meetings
  - Monthly partner working group meetings to steer the program

- **Partners**
  - DoD
  - NIST
  - Apple
  - Ericsson
  - Google
  - IBM
  - Intel
  - Microsoft
  - Nokia
  - Qualcomm
  - VMware

Group A: Physical and Link Layer
Circuits, Hardware, Antennas w/ Physical Layer, Coding, Signal Processing, etc

Group B: Network and Cloud
Edge Computing, Cloud with Networking, Machine Learning with Optimization

Group C: Security and Trust
Security, Privacy, Blockchain

Group D: Network Research Infrastructure

Group E: Emerging Verticals and use-based driven research


First in-person workshop: Nov. 6-7, 2023, hosted by Ericsson Silicon Valley (participants: 52% industry, 40% academia, 8% government)

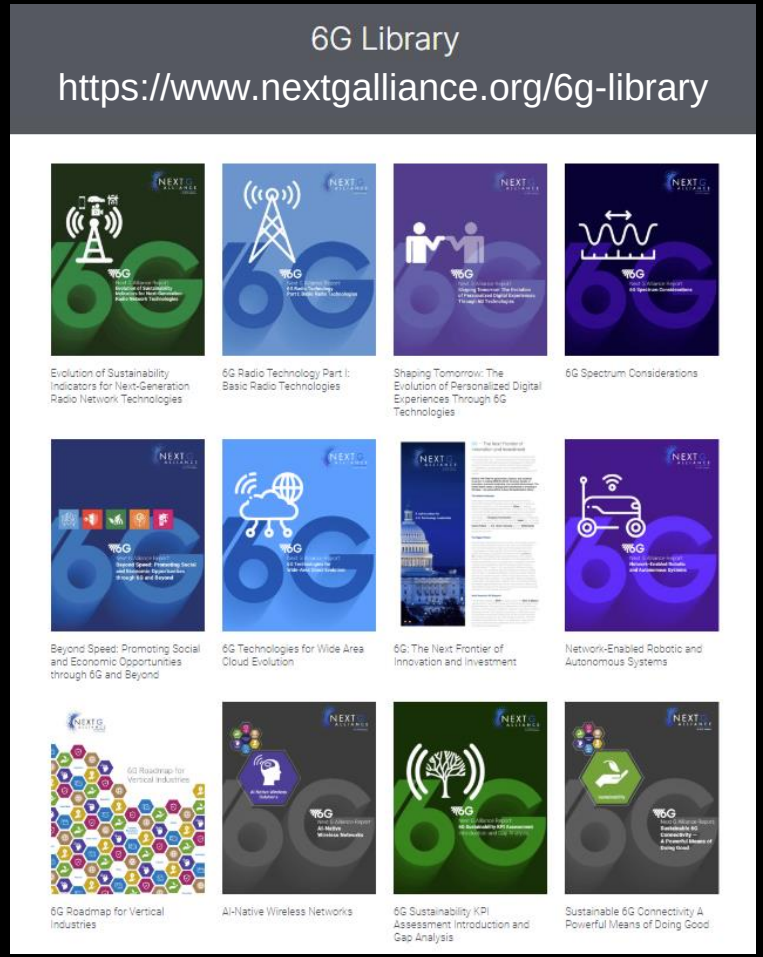
Academia – Ericsson's 6G Engagements

Princeton University NextG	• NEW! 6G research, US policy • Andrea Goldsmith
University of Texas, Austin 6G@UT Research Center	• NEW! 6G for Mobile XR • Jeff Andrews, Todd Humphreys, Alan Bovik
Stanford University SystemX	• NEW! 6G physical layer • John Cioffi
New York University NYU Wireless	• 6G research, mmW, THz • Ted Rappaport, Tom Marzetta
MIT Research Laboratory of Electronics	• Zero-Energy IoT • Tomas Palacios, Anantha P Chandrakasan
Rutgers University WINLAB	• 6G research, testbed • D. Raychaudhuri
University of California Berkeley Netsys	• Distributed edge cloud, Networking • Scott Shenker, Sylvia Ratnasamy
University of Colorado Boulder	• XR and holographic use cases • Ellen Yi-Luen Do

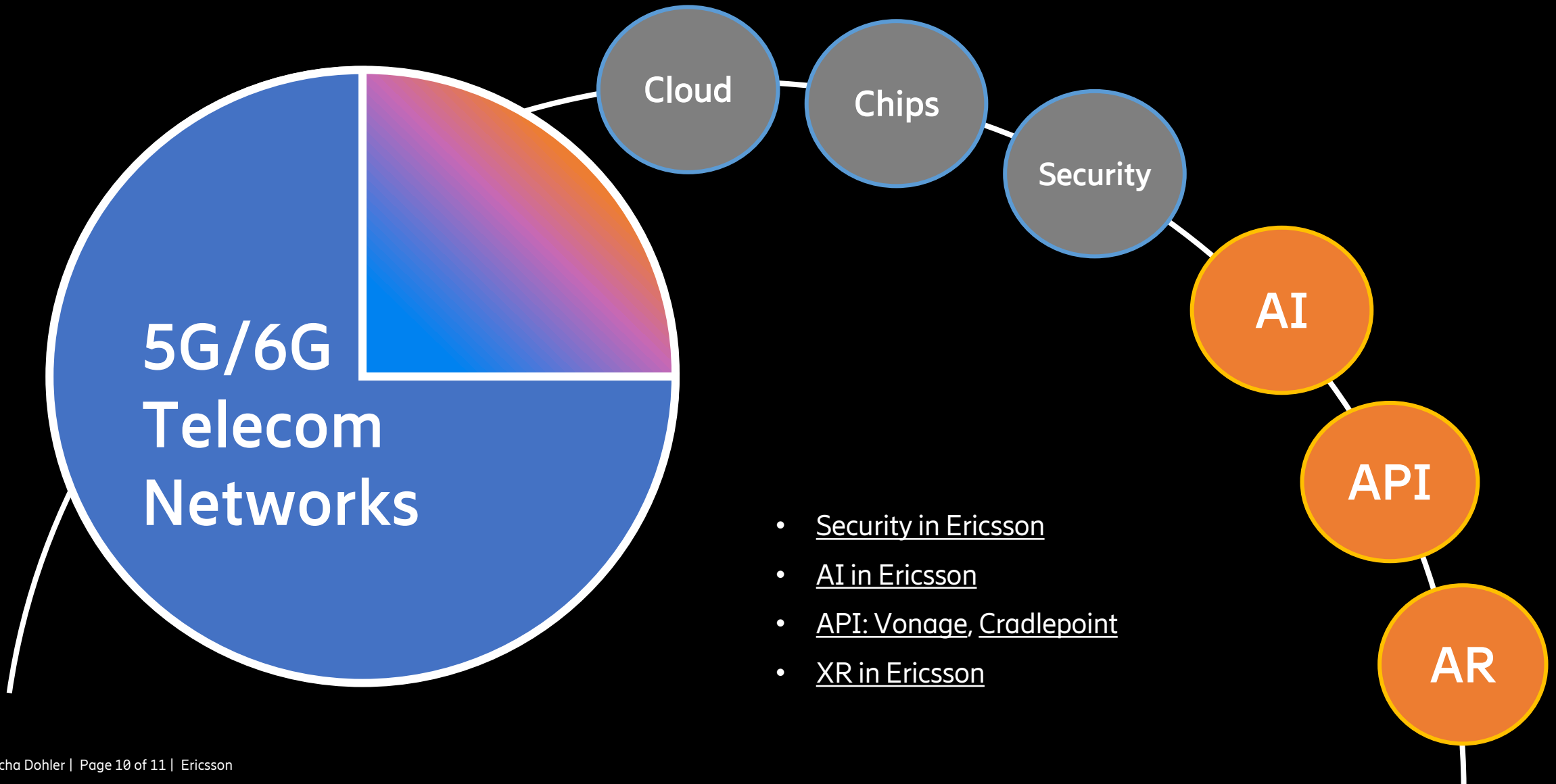
Industry – ATIS and NextG Alliance (NGA)

Purpose

- Advance North American **global leadership** over the 5G evolutionary path and 6G early development.
- Create a Next G development roadmap that will promote a **vibrant marketplace** for 6G introduction, adoption and commercialization with North American innovation in mind.
- Develop a set of national priorities that will **influence government** applied research funding and promote incentivized government actions.
- Link: https://www.nextgalliance.org



Industry – Leveraging US Strength



- Security in Ericsson
- AI in Ericsson
- API: Vonage, Cradlepoint
- XR in Ericsson

ericsson.com/future-technologies