

NOKIA

Global 6G Initiatives

Research Landscape



Policy Brief

Different models to research the Next Generation ICT Infrastructure

EU Model

- EU framework: Collaborative research 70% funded for industry and 100% for academia
 - Consortium confidential and public documents
- National research: partial funding by regional governments
 - Mostly consortium confidential
- Competitors join in flagship projects for research on architectures, use cases, pre-competitive technology
- Separation of competitors in smaller focused projects with complementary partners
 - Shared foreground IPR and access rights to background
 - Reorientation of research less flexible due to dependencies with other partners.

US Model

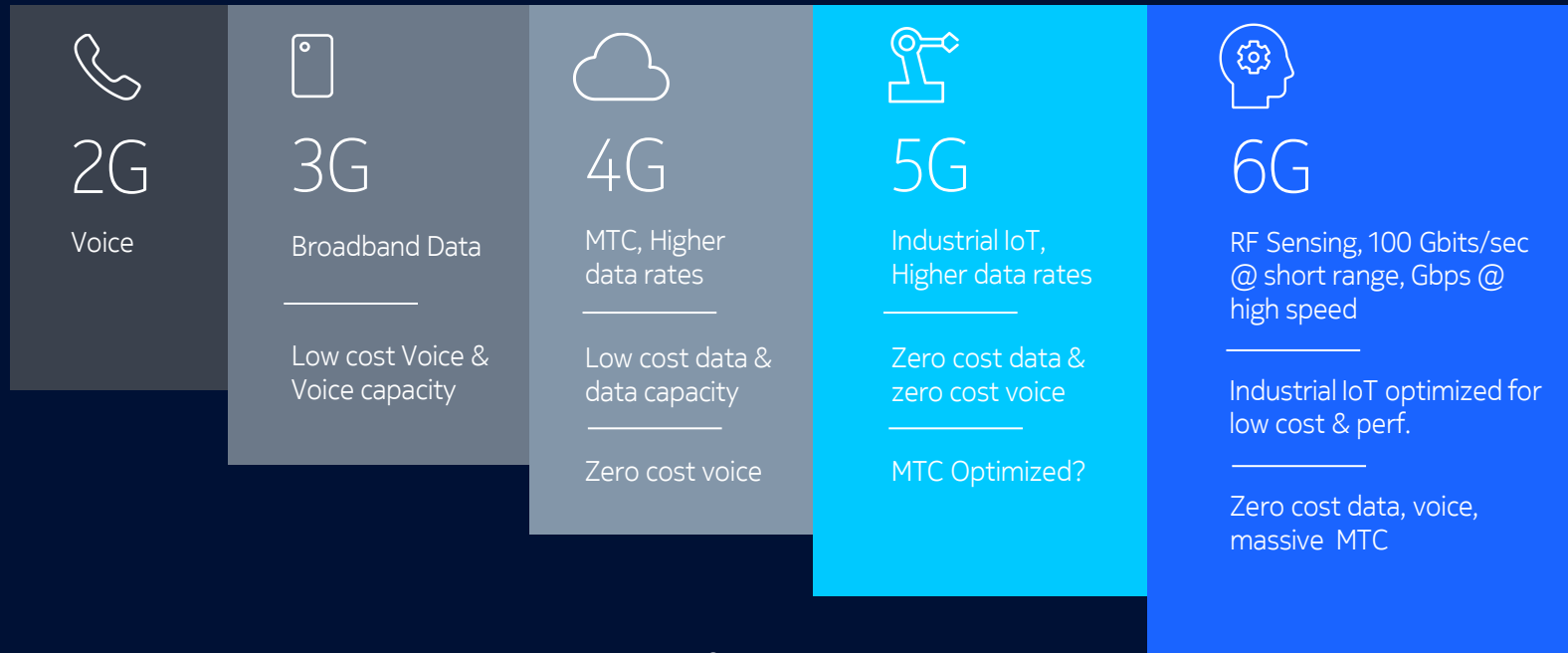
- 100% funded academic research through NSF, 0% funding for industry (industry is co-sponsor)
 - Open
- Govt contract research (e.g., DARPA) – 100% funded
 - Secret
- Consensus work in non-funded alliances (e.g., Next GA)
- Industry collaborates in non-funded strategic partnerships driven by business interests
 - Sole ownership of IPR
 - Flexible reorientation of research

Contents

- 1.Introduction
- 2.Global 6G Overview
- 3.EU 6G activities
- 4.US 6G Activities



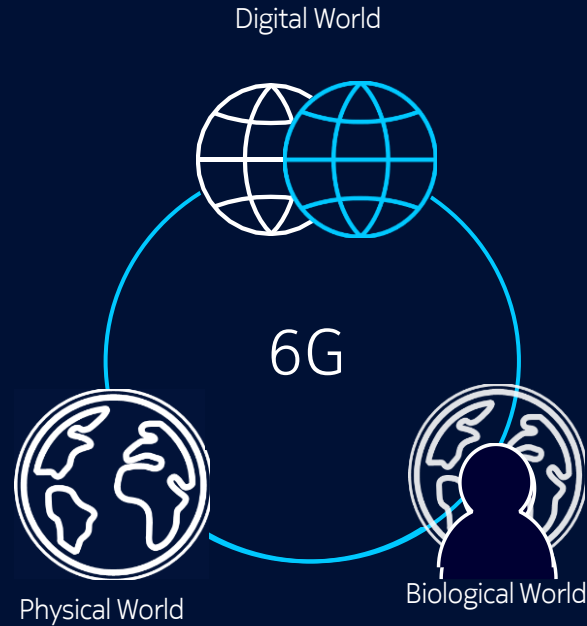
The past, present, and future



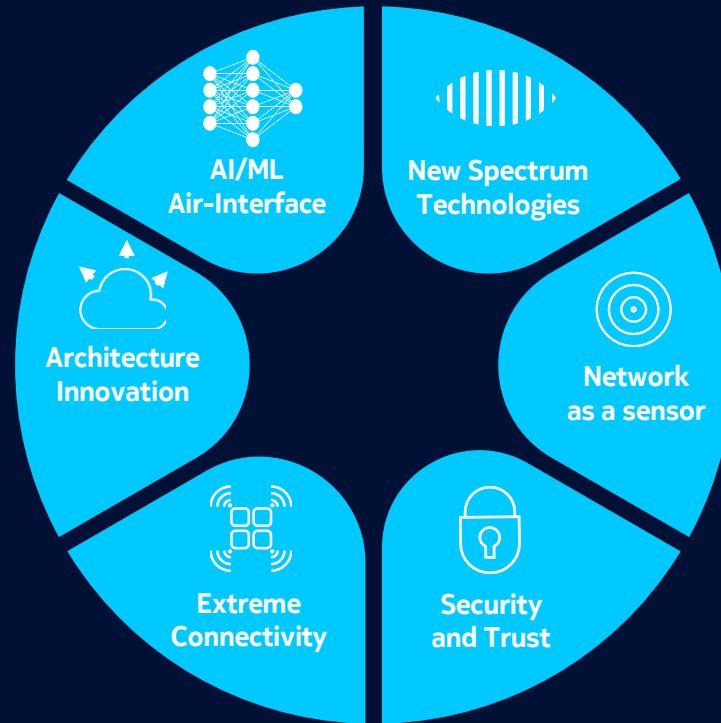
Each new generation is about optimizing the use case of the previous generation and introduction of new use cases

Twinning physical and biological world

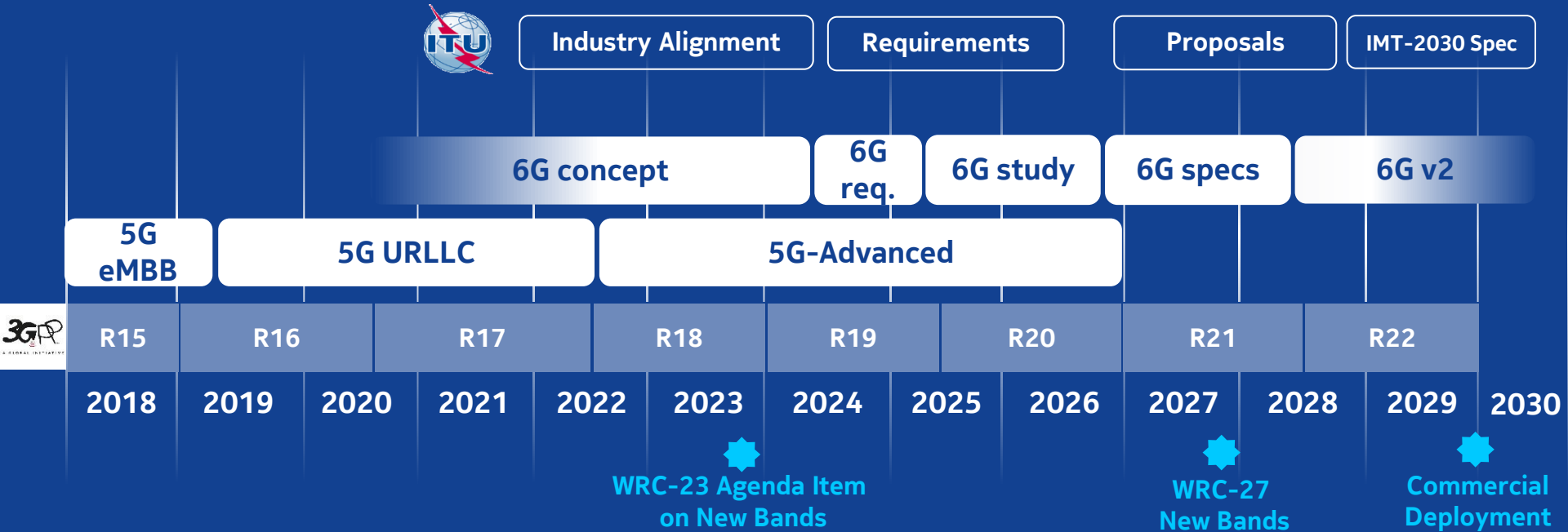
Digital world as the perfect knowledge engine to augment human potential



Six key areas for the 6G essential infrastructure



6G Timeline



6G Landscape Threats & Issues

- Increased geo-political tension
- Increased importance of ICT as asset for national security and economic competitiveness
- Major government 6G research investment

Geo-Politics

- Proposal from Korea to Deploy 2028
- IMT2030 timeline also appears accelerated
- 5G timeline was faster than 4G

Accelerated Timeline

- Industry is increasing activities in 6G space
- Series of 6G Use case white papers
- Kick-off of joint research alliances in different regions

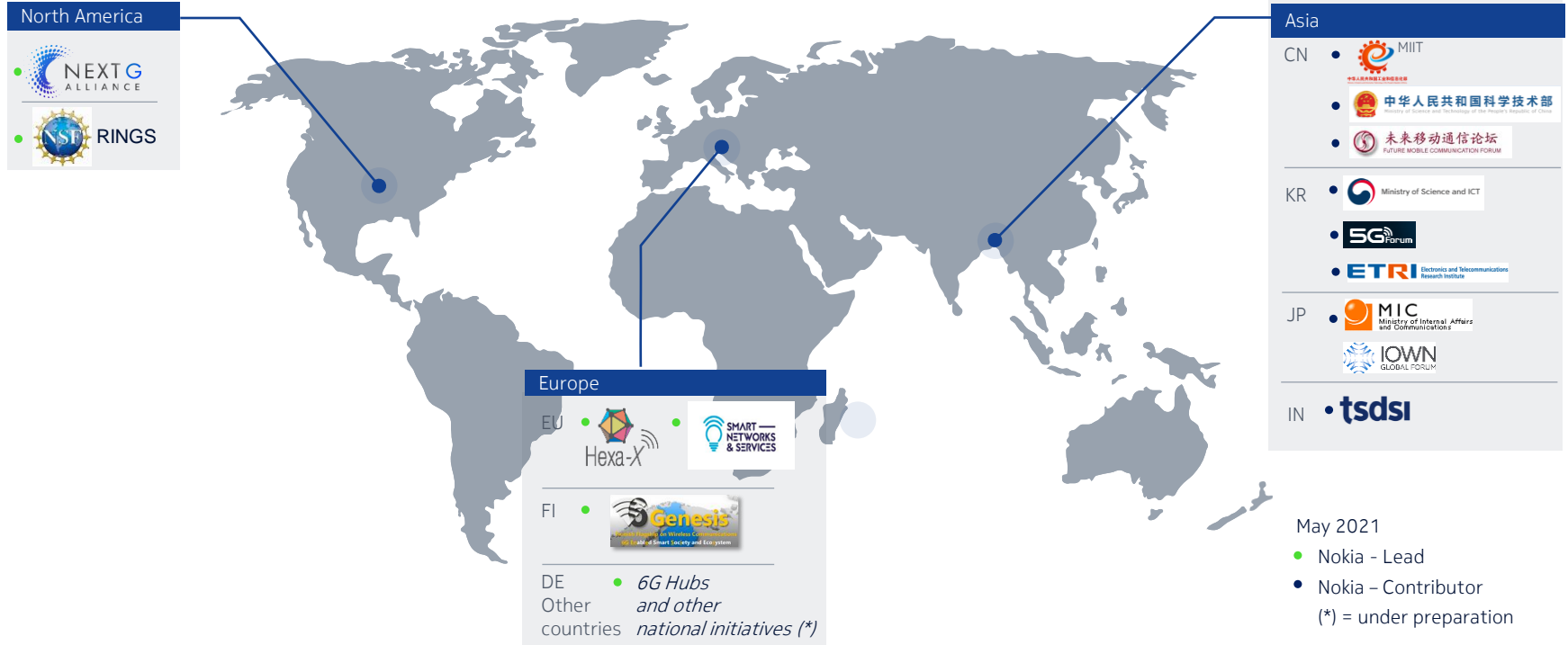
Leadership

Contents

1. Introduction
2. Global 6G Overview
3. EU 6G activities
4. US 6G Activities



6G Regional Initiatives



Contents

1. Introduction
2. Global 6G Overview
3. EU 6G activities
4. US 6G Activities



EU Funding Model Summary

EU Commission: Horizon Europe

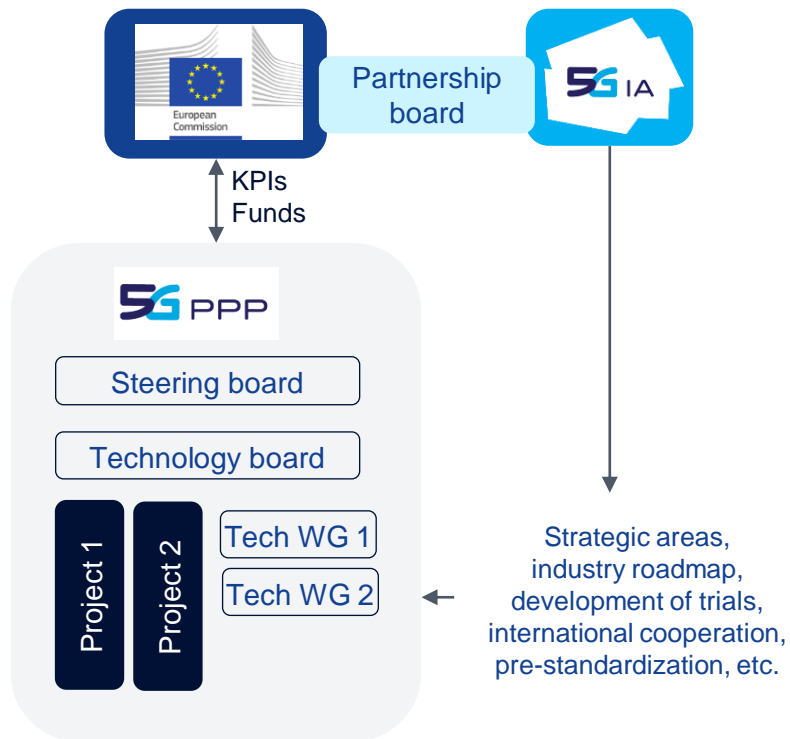
- Framework programs (FP) for research in strategic areas (e.g., ICT)
 - FP8: Horizon 2020 (2014-2020)
 - FP9: Horizon Europe (start 2020)
- Funds collaborative research projects (service providers, vendors, SME, academia)
 - Selection through calls for proposals (1/7 acceptance, partial funding)
 - Integrated Projects “Flagship” (8-20 M€, 10-30 partners)
 - Specific Targeted Research Projects (~4-8 M€, 5-10 partners)

Public Private Partnership – 5GPPP

- Partnership between EU and Industry, e.g., 5GPPP, is recent instrument (2014) to enhance impact through co-ordination across research projects
- Contract between public (EU) and private (5G IA) defines funding level, key objectives (KPIs) and associated research and innovation roadmap

5G IA

- Industry Association of **operators, manufacturers, research institutes, universities, verticals and SMEs** that represents private sector in 5GPPP
- Consults the EU on Calls for Proposals based on industry roadmap and gets involved in evaluations



5GPPP Key facts & figures

	# projects	Total EU Funding	Focus
Phase 1 (2015-2017)	19	130 M€	Core technologies
Phase 2 (2017-2019)	21	150 M€	Demos/PoC/Core tech components
Phase 3 (2018-2022)	19+	427 M€	Trials

- **Contractual Arrangement signed on Dec 17, 2013**
 - First discussions and pre-definition in 2012-2013
- **EU contractual implementation 707 M€ funding**
 - 100% funding for non-for-profit (incl. academia) and 70% for industry.
 - 5GIA co-ordination ensured 3 B € extra contributions for projects funded by the member states and in kind contributions by the industry.
- **Global collaborations**
 - 7 MoUs between 5G IA and peer associations that lead research in Americas (e.g., PAWR NSF), China, Japan, South Korea, Brazil, India and Canada
- **Examples past projects**
 - 5G METIS: 2012-2015 - 15 M€
Flagship project that laid the foundation for 5G (Pre 5GPPP)
 - 5G Car: 2017-2029 - 5 M€
Research project addressing specific challenge (5GPPP Phase 2)

Smart Networks And Services Partnership



- Broader scope than 5G PPP
- Supported by broader communities
- More than 1000 organisations
- Includes; Industry, SMEs and Research Community (R&D centers and universities)

Nokia leading the EU's 6G flagship project Hexa-X



- Hexa-X is a flagship research initiative from the European Commission, with strong participation of major industry and academia stakeholders in Europe, to develop the foundation and contribute to industry consensus leading beyond 5G to 6G.
- The focus is on structuring, framing, and developing technology for connectivity needs in the 2030 timeframe, as a first step towards realizing 6G.
- It aims to develop key technology enablers in the areas of
 - fundamentally new radio access technologies at high frequencies and high-resolution localization and sensing;
 - connected intelligence through AI-driven air interface and governance for future networks, and
 - 6G architectural enablers for network disaggregation and dynamic dependability.

Hexa-X vision on 6G and research challenges



As the **overall project leader** for Hexa-X, Nokia is responsible for the coordination of activities under the contract with the European Commission as well as the overall project monitoring and supervision. We lead the way in the next generation of wireless networks.

Hexa-X is a consortium of 25 partners led by Nokia



The stakeholders represent the full value-chain of future connectivity solutions ranging from network vendors, communication service providers, verticals, and technology providers, as well as the most prominent European communications research institutes.



Contents

1. Introduction
2. Global 6G Overview
3. EU 6G activities
4. US 6G Activities



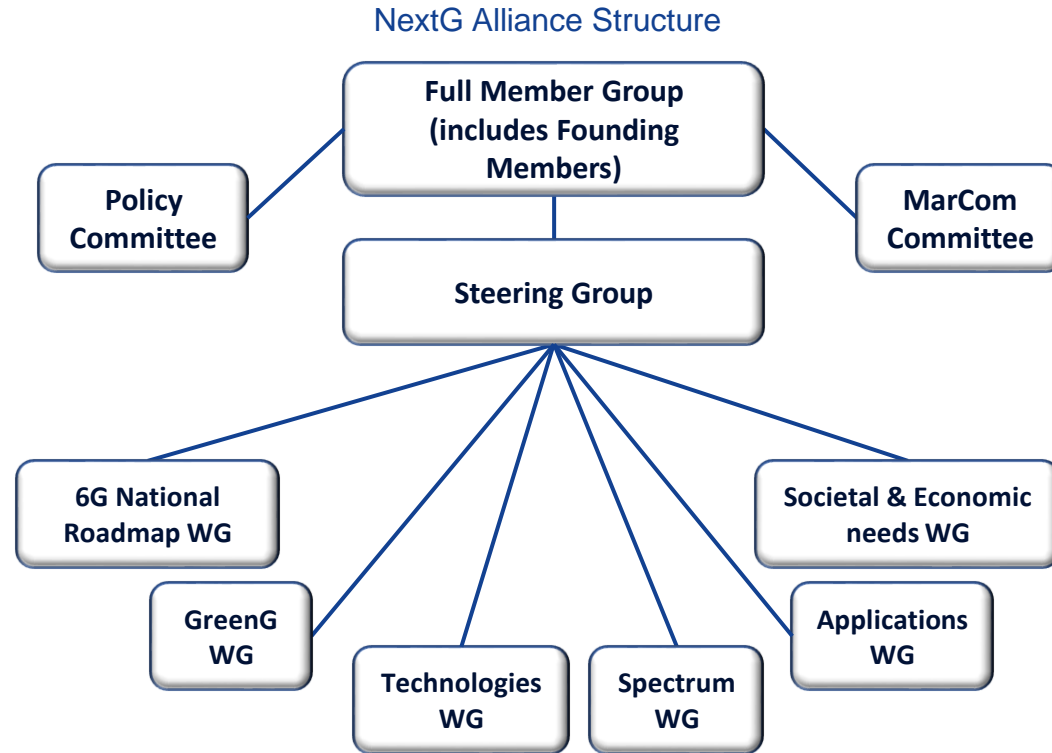
Next G Alliance Mission and Vision

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



Contribution-driven, pre-consensus building forum

NSF RINGS

- \$40 million funding - long-term pre-competitive foundational research projects with academia
- Boosting resilience alongside network intelligence, bandwidth, latency and scalability.
- Sponsors : Apple, Ericsson, Google, IBM, Intel, Microsoft, Nokia, Qualcomm and VMware; Govt - DoD and NIST
- Solicitation for proposals by 07/21. ~40 grants with 1M\$ each over 3 years. Awards by Eo'21.



NIST



Google

IBM

intel.

Microsoft

NOKIA

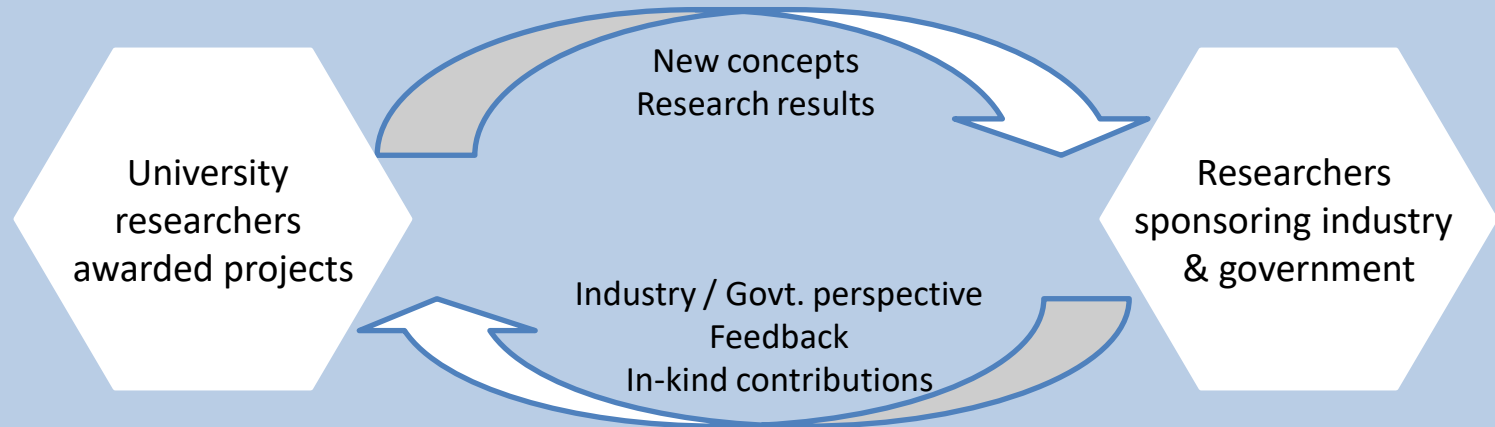
Qualcomm
Qualcomm
Technologies, Inc.

vmware

RINGS Partners Working Group

Goal:

- Create an eminent US research community on Next Generation networks
- Enable meaningful sharing and collaboration
- Facilitate co-ordination to benefit all parties



NIST



Google

IBM

intel

Microsoft

NOKIA

Qualcomm
Qualcomm
Technologies, Inc.

vmware