



# **The European path towards Beyond 5G and 6G**

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# Beyond 5G/6G: Global Context

	B5G/6G Initiative
	<ul style="list-style-type: none"><li>- “Secure 5G &amp; Beyond Act” March 2020</li><li>- DoD Testbed programme, \$ 600 million</li><li>- Next-G initiative, industry federation (ATIS); RINGS (NSF)</li><li>- Open RAN Drive, \$2Bn</li></ul>
	<ul style="list-style-type: none"><li>- MIC “Roadmap towards 6G”, June 2020, B5G Promotion Consortium</li><li>- METI support</li><li>- \$300+200million</li><li>- Open RAN Drive, \$2Bn</li></ul>
	<ul style="list-style-type: none"><li>- MSIT 6G programme, September 2020, 5G Forum</li><li>- ≈ \$200 million public support</li></ul>
	<ul style="list-style-type: none"><li>- MIIT 6G programme, creation of IMT 2030 Promotion committee (2019)</li><li>- Multi € Billion until 2035, including industrialisation</li></ul>
	<ul style="list-style-type: none"><li>- <b>6G Smart Networks and Services Partnership proposal: € 900 millions / 7 yrs</b></li><li>- <b>Drivers:</b> <i>Strategic autonomy, Green Deal, Cybersecurity</i></li><li>- <b>Member States Initiatives:</b> Finland, Germany, France, Austria ..</li></ul>



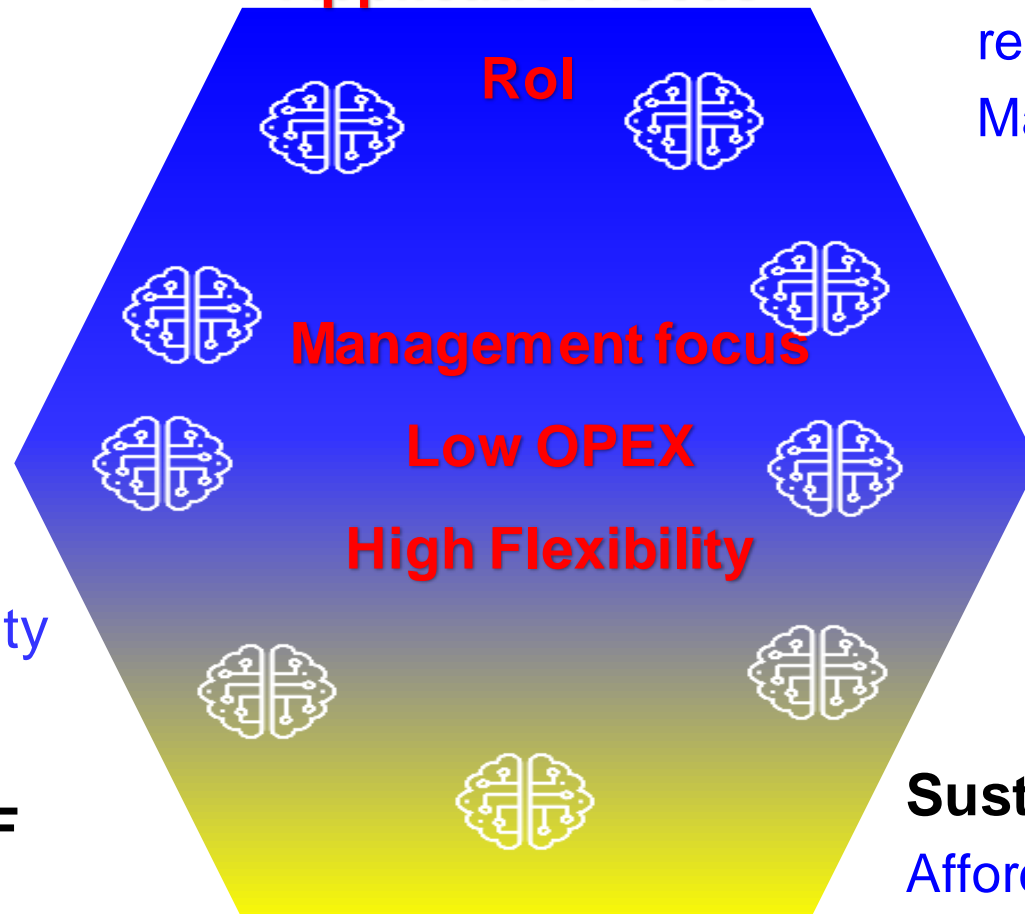
# Motivations from 5G to 6G

## New classes of applications

XR, Holographic coms, Digital twins  
Internet of Senses  
Deterministic E2E

Automated &  
autonomous  
Infra/Service Mgt  
-Programmability  
-Intelligence connectivity

Ultra low energy/EMF  
-connectivity  
-use cases



## Vertical use cases beyond 5G

Extending 5G KPI's in speed, latency,  
reliability, density, positioning  
Massive M2M

## Ultra high security/trust/ Privacy

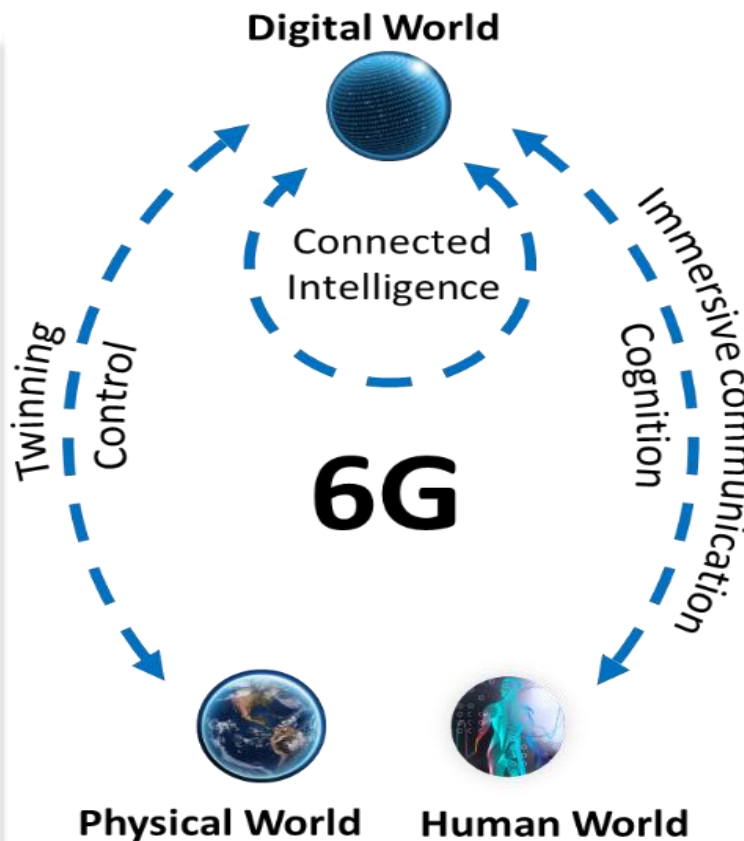
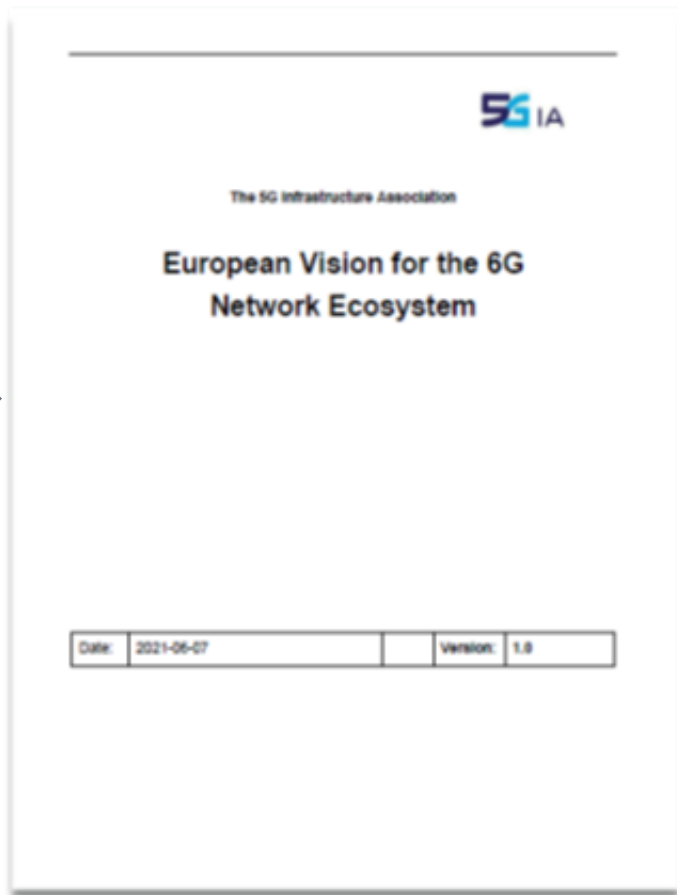
E2E, From component to application

## Sustainable Development goals

Affordability, Accessibility  
Openness..



# Vision



Massive Digitisation:  
representation



Connected Intelligence:  
Awareness, RT status



Network Compute Fabric  
Decision, action

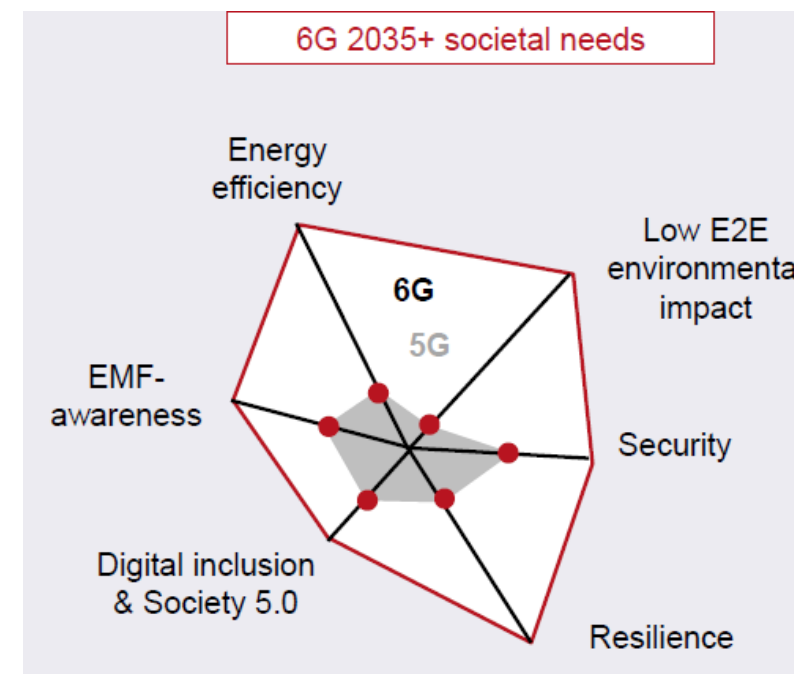
➤ <https://5g-ppp.eu/5g-ppp-phase-3-6-projects/>

➤ <https://hexa-x.eu/deliverables/>

➤ <https://5g-ppp.eu/wp-content/uploads/2021/06/WhitePaper-6G-Europe.pdf>

# KPI's, KVI's (under study)

	5G	6G
Traffic capacity	10 Mbps/m <sup>2</sup>	1-10 Gbps/m <sup>3</sup>
DL rate	20 Gbps	1 Tbps
UL Rate	10 Gbps	1 Tbps
Uniform User experience	50-100 Mbps 2D	> 1Gbps 3D
Latency	1 ms	0,1 ms
Jitter	NS	1 microsec
Reliability	1 E-5	1 E-9
Energy/bit	NS	1 pJ/bit
Location accuracy	10 cm 2D	1 cm 3D
Inference Reliability	-	- TBD
Energy Goal	-	- TBD



Source, CEA LETI EU-Korea Workshop, October 2020

Democracy	Ecosystem	Innovation
Privacy	Sustainability	Safety
Fairness	Business value	Security
Digital inclusion	Economic growth	Regulation
Trust	Open collaboration	Responsibility
	New value chain	Energy consumption

# Important: Micro electronics and Components

## Communication and Sensing

Enabling ever growing data rates at both networks and device side. Takes into account requirements from Radio access networks (RAN); Consumer grade connectivity; Industrial grade connectivity; Datacenters

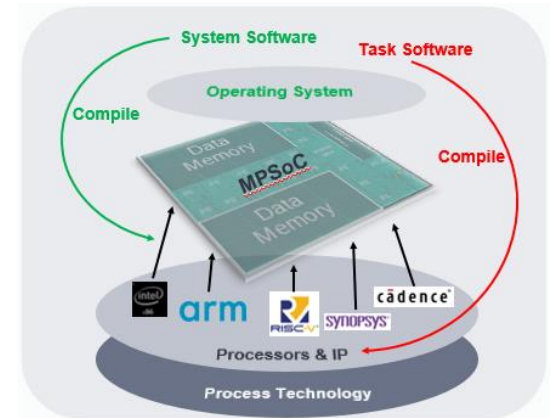
Building up on Europe RF strengths

## Sense and Power

Connectivity of billions of sensors to achieve industrial, social and environmental goals. Challenges: RF bandwidth availability, optimization of energy usage, reliability and maintenance, security of transmitted data, utilization and analysis of the data collected from the sensors. Challenges in amount of data & power

## Computing and Storage (e.g. Risc V)

key technologies to build trustworthy and competitive systems for communication (terminals and the RAN) and different applications (IoT, personal devices and personal mobile robotics). Focus on programmable computing platforms and the included storage components under different operating constraints and the need to support legacy software.



# Towards a 6G European Initiative

5G PPP - Bridging phase

**1 flagship + 8 6G exploratory projects = 60 M€**



Strategic  
Autonomy in  
critical technology  
areas



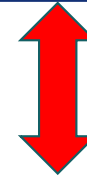
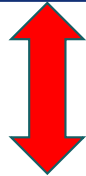
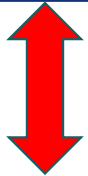
European Green  
Deal



Full digitalisation  
of the Industry



EU Industry  
global  
competitiveness



Industry 6G Partnership Proposal-Smart Networks & Services Joint Undertaking

[https://ec.europa.eu/info/files/european-partnership-smart-networks-and-services\\_en](https://ec.europa.eu/info/files/european-partnership-smart-networks-and-services_en)

6G SNS  
IA

CISPE.cloud

2020  
NETworld

NESSI



Alliance for  
Internet of Things  
Innovation

Accelerating 5G Deployment: CEF2, pan  
European corridors for Connected Cars

6G Vision and technologies across a  
comprehensive supply chain

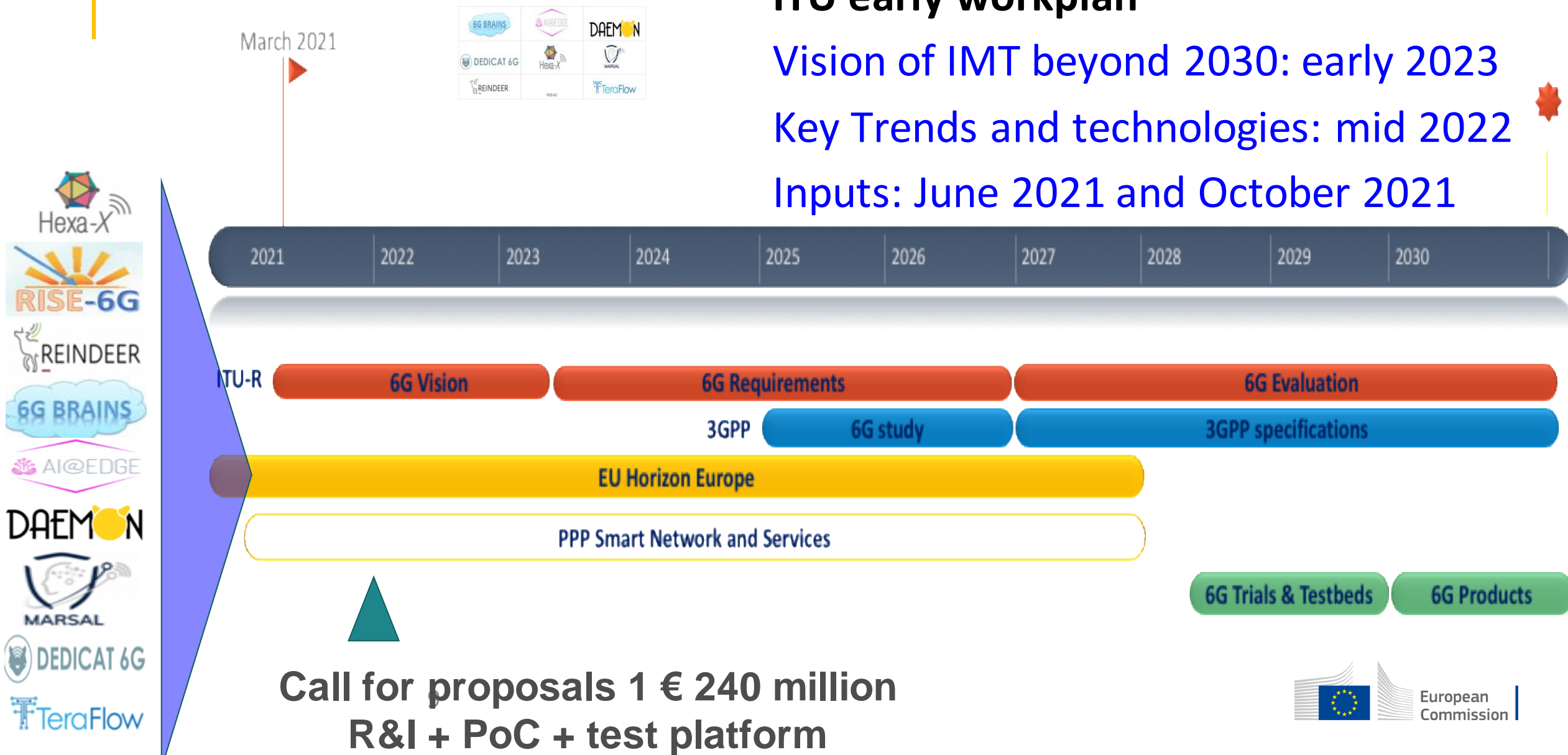
# Tentative Timeline

## ITU early workplan

Vision of IMT beyond 2030: early 2023

Key Trends and technologies: mid 2022

Inputs: June 2021 and October 2021





# Tentative short term Timeline

19 Nov. 2021 - SBA Adoption by the Council

30 Nov. 2021 - Publication in the OJ and entry into force

15 Dec. 2021 - Governing Board 1st meeting

- Adoption of RoP, Financial rules, JU WP 2022, SRIA, MGA, decision to launch the call

14 Jan. 2022 – Call opening

Jan. to June 2022

- Office setup (recruitment, SLAs, IT, offices)
- Proposals evaluation

July 2022 – Launch of GAPs

# Proposed structure of the Work Programme (Draft)



5G Evolution (40%) → evolutionary path



6G (60%) → revolutionary path

**Stream A (RIA):** Smart communication components, systems and networks for 5G mid-term Evolution systems

- **Radio:**
  1. Address basic building blocks
  2. Develop of RAN systems considering integrated terrestrial and NTN
- **Architecture and Core:**
  3. Evolved architectures
  4. Advanced cloud and edge solutions
  5. Converged packet-optical transport network
- **System and security:**
  6. Secure and reliable softwarization
  7. Real-time zero-touch service technologies

**Stream B (RIA):** Research for radical technology advancement towards 6G

➤ System Architecture

➤ Wireless Communication Technology and Signal Processing

**Cross Strand “Holistic” –Project**

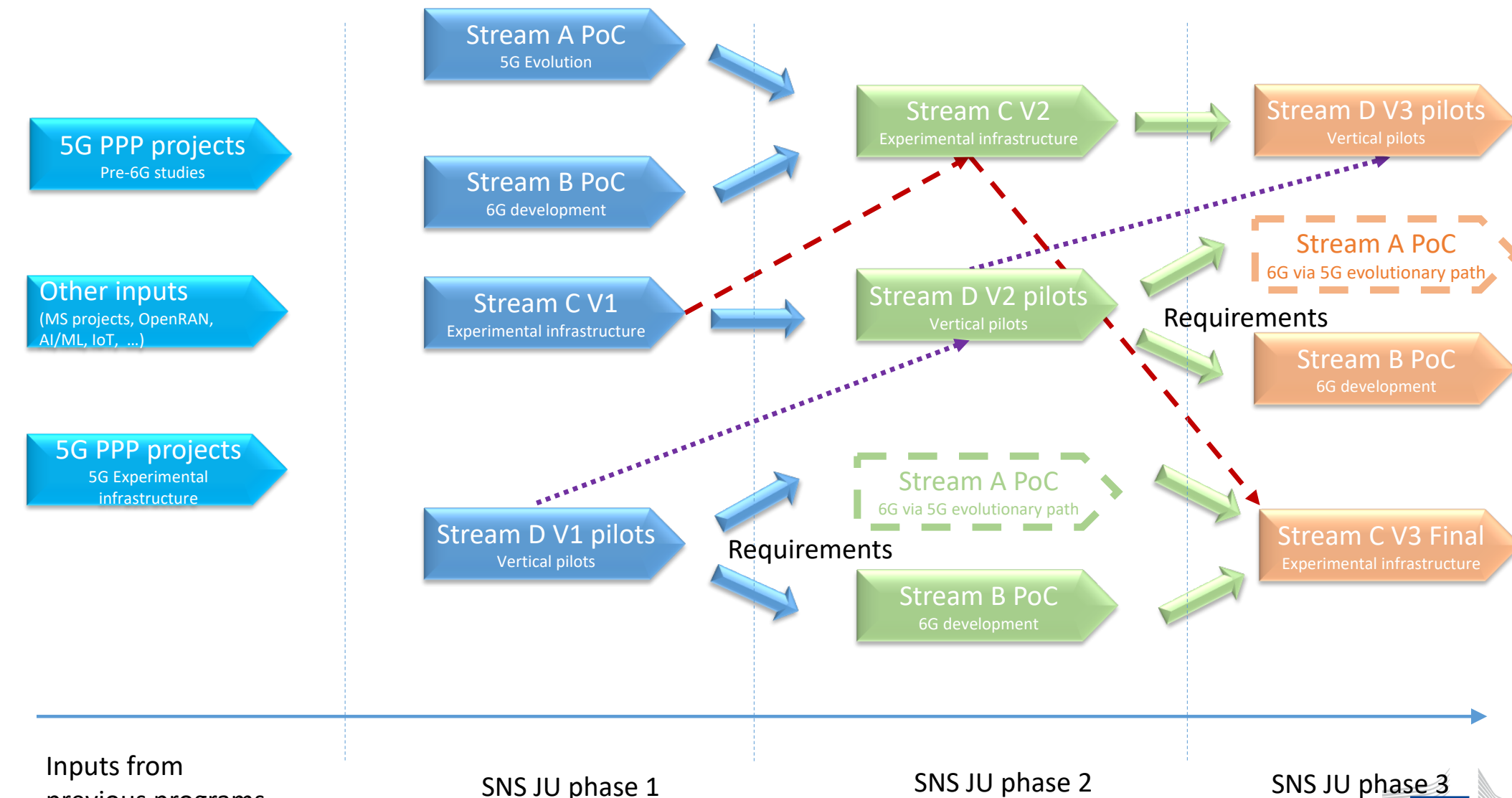
➤ Trustworthy and Secure Service Development and Provision

➤ Communication Infrastructure Technologies

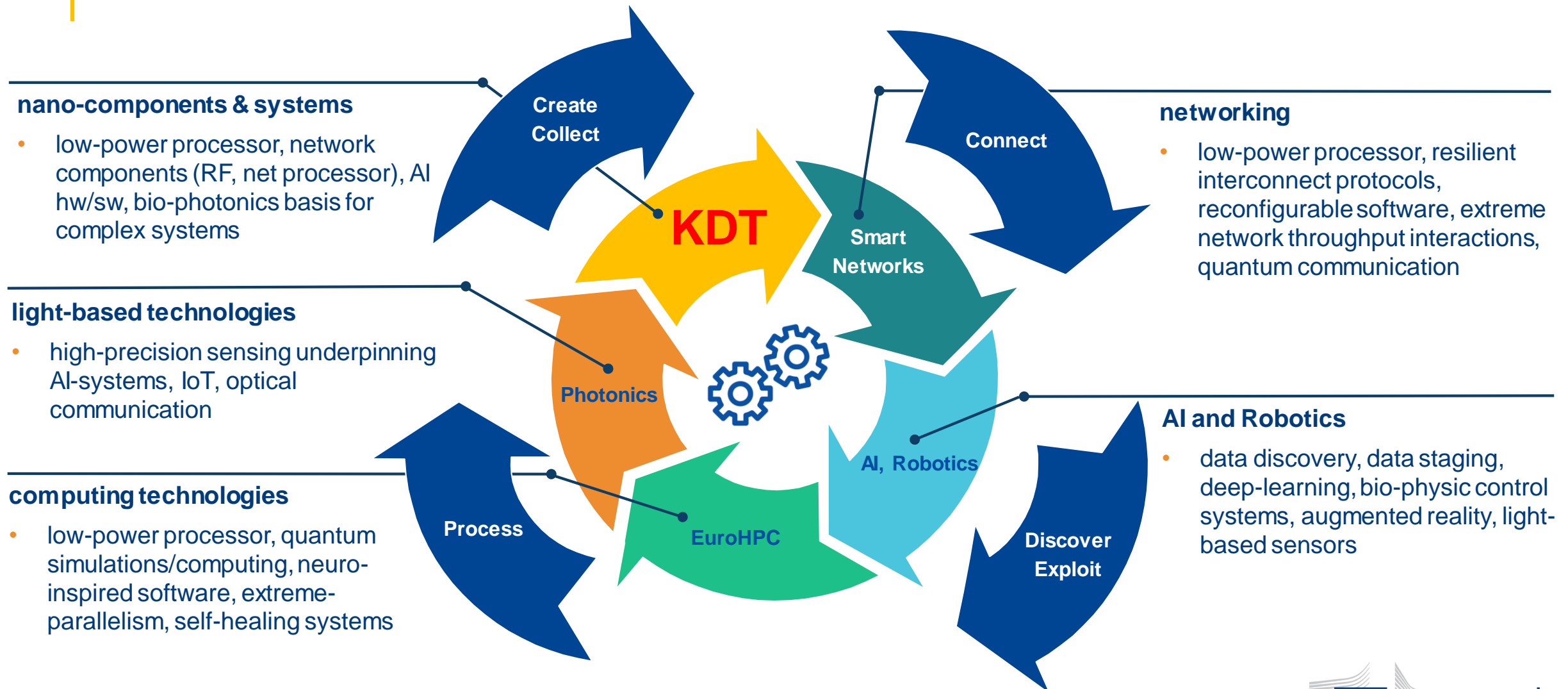
**Stream D (IA):** Large Scale SNS Trials and Pilots with Verticals

**Stream C (RIA):** SNS experimental infrastructures

# Interlinking of Streams in Phases



# Cooperation Opportunities





# Beyond 2022

The SNS Work Plan will be updated in 2022

→ Starting with the Updating the Strategic Research and Innovation agenda

**Stakeholders work is essential to design the European technological (and societal) agenda which will make Europe a lead region for B5G and 6G**

# Thank You !

More info:

**Smart Networks and Services (6G) Roadmap proposal**

<https://5g-ia.eu/sns-horizon-europe/>

**Horizon Europe Partnerships (23 Feb PR)**

[https://ec.europa.eu/commission/presscorner/detail/en/IP\\_21\\_702](https://ec.europa.eu/commission/presscorner/detail/en/IP_21_702)

**Smart Network and Services (6G) EC announcement**

<https://ec.europa.eu/digital-single-market/en/news/europe-puts-forward-proposal-joint-undertaking-smart-networks-and-services-towards-6g>