



**NETWORLD  
EUROPE**

**STRATEGIC RESEARCH AND INNOVATION AGENDA (SRIA) 2021-27**  
**“SMART NETWORKS IN THE CONTEXT OF NGI”**

**STRATEGIC RESEARCH AND INNOVATION AGENDA**  
**A NETWORLD EUROPE COMMUNITY EXERCISE FOR GUIDING COMMUNICATION INNOVATION IN**  
**EUROPE**

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 Network World Europe Steering Board Chair



## NETWORLD EUROPE HISTORY



- Evolution of previous initiatives from Europe
  - Merging of Net!Works and ISI, branded as **Networld2020**
  - Renamed in December 2020 to reflect the new priorities of **Horizon Europe**
- Founded late 2013 to facilitate the launching of a counterpart to EC in the communications domain (an evolution of previous work)
- Current format settled from 2016, when formally separated from 5G-IA

## WHAT IS NETWORLD EUROPE?



- ETP (European Technology Platform)
- For communications networks and services
  - Involved in the Smart Networks and Services initiative
- Volunteer organization, no explicit funding (contributions in-kind)
- Open to everyone
  - simple rules for acceptance membership (1000+ members)
  - No fees
  - Most general actions on web
  - Meetings (focused) organized few times per year
  - Industry/SMEs/Academia + Cooperation partners
- Managed by a Steering Board
  - Elected every two years (per body)

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## OBJECTIVES



- To develop position papers on technological, research-oriented and societal issues
- To seek discussion of issues with decision makers in the political and public domain as well as in the industry and research community to bridge the gap between R&D and the expectations from the European society.
- To regularly develop an updated Strategic Research and Innovation Agenda (SRIA) for Europe in the communication networks, now for the SNS JU according with specific MoU
- To strengthen Europe's leadership in networking technology and services so that it best serves Europe's citizens and the European economy.
- To support the 5G PPP initiative and the SNS Joint Undertaking

## STRUCTURE



### Networld Europe has four working groups active

- Operates in Working Groups (and taskForces)
  - Expert Group (Chair: Prof. Ari Pouttu)
    - Technical support for long term research in Europe
  - Satellite WG (Chair: Dr. Tomaso de Cola)
    - Promotion and coordination of technical activities pertaining to the satellite Telecom community
  - SME WG (Chair Mr. Jacques Magen)
    - Promotion and support of EU R&D into SMEs of the sector
  - Vertical Technologies WG (Chair: Prof. Maziar Nekovee)
    - Techno-economics and business aspects
    - Enabling technologies for vertical ecosystem transformation and federation

## SRIA – 2021-2027



### Strategic Research and Innovation Agenda

#### ❑ What is the SRIA?

- ✓ Reference document on challenges associated with the communications domain
- ✓ Community built
- ✓ Updated every 2-3 years
- ✓ This last update based in a large common process.
  - ✓ Triggered in the Visions for Future Communication Summit event, Lisbon 2019
  - ✓ Developed inside a team led by Ari Pouttu and Jyrki Huusko for about six months
  - ✓ Formal public consultation process
  - ✓ Overall, about 150 elements contributed, coming from about 100 organizations
- ✓ Increasingly touching on adjacent topics, due to unavoidable interrelations

#### ❑ What is it used for?

- As a driver for designing the future EU R&D programs, in particular that associated with communications
- As an independent indication of scientific challenges across Europe
- As a recommended scope document for national programs in multiple countries
- As an alignment document on the expected performance improvements in several scientific domains related with communication networks and services

## NetWorld 2020 SRIA

### Smart Networks in the context of NGI



1. Introduction
2. Policy Frameworks and Key Performance and Value Indicators towards 2030 (Editor: Ari Pouttu, Werner Mohr)
3. Human Centric and Vertical Services (Editor: Josep Martrat)
4. System Architecture (Editor: Artur Hecker)
5. Edge Computing and Meta-data (Editor: Kari Seppänen)
6. Radio Technology and Signal Processing (Editor: Wen Xu)
7. Optical Networks (Editor: Jörg-Peter Elbers)
8. Network and Service Security (Editor: Emmanuel Dotaro)
9. Satellite Communications Technologies (Editor: Alessandro Vanelli-Coralli)
10. Opportunities for Devices and Components (Editor: Andre Bourdoux)
11. Emerging Technologies and Challenging Trends (Editor: Rui L Aguiar)

Note: this was done under the scope of the previous naming of the ETP.

Document at:

<https://bscw.5g-ppp.eu/pub/bscw.cgi/d367342/Networld2020%20SRIA%202020%20Final%20Version%202.2%20.pdf>

Webinar available at

<https://www.networldeurope.eu/post-networld2020-sria-webinar-3-4-february-2021/>



## VISION FOR SMART NETWORKS



Future 6G networks will be fully integrated with all societal infrastructure:  
smart networks and services

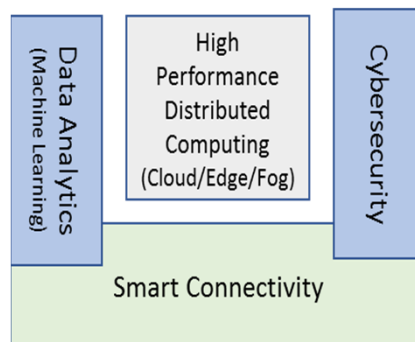
**Smart Networks and Services: it is not about  
end-to-end transport any more**

**Smart Networks and Services:  
a distributed, virtual, tailored ICT services factory**

# NETWORK TECHNICAL VISION



- **Smart Networks:**
- Integrated C3S: Computing, Communication, Control and Sensing
- Single, unifying, control framework
- Instantiation and execution of any control architecture(s)
- Isolated control and data domains for each tenant
- Multitenancy and federation of resources and slices
- Low delay, low energy highly efficient radios
- Higher capacity and more flexible optical systems
- Ubiquitous Satellite communications



**Smart Networks: fundamental cornerstone for the production of all services**

## SOME REQUIREMENTS



Target KPI	5G NR (Rel.16)	Short-term Evo. ~2025	Medium-term Evo ~2028	Long-term Evo. ~2030
Spectrum	<52.6 GHz	<150 GHz	<300 GHz	<500 GHz
Bandwidth	<0.5 GHz	<2.5 GHz	<5 GHz	<10 GHz
Peak Data Rate	DL: >20 Gbps	DL: >100 Gbps	DL: >200 Gbps	DL: >400 Gbps
User Data Rate	UL: >10 Gbps	UL: >50 Gbps	UL: >100 Gbps	UL: >200 Gbps
Density	>1 device/sqm	>1.5 device/sqm	>2 device/sqm	>5 device/sqm
Reliability (BLER)	URLLC: >1-10 <sup>-5</sup>	>1-10 <sup>-6</sup>	>1-10 <sup>-7</sup>	>1-10 <sup>-8</sup>
U-Plane Latency	URLLC: <1 ms	<0.5 ms	<0.2 ms	<0.1 ms
C-Plane Latency	<20 ms	<10 ms	<4 ms	<2 ms
Energy Efficiency (Network/Terminal)	Qualitative	>30 % gain vs IMT-2020	>70 % gain vs IMT-2020	>100% gain vs IMT-2020
Mobility	<500 Km/h	<500 Km/h	<500 Km/h	<1000 Km/h
Positioning accuracy	NA (<1 m)	<30 cm	<10 cm	<1 cm

	Short term ~2025	Medium term ~2028	Long term ~2030
Configuration	Only a minimal initial pre-configuration (only domain name + security association data, e.g. private/public key)	No human intervention	No human intervention across different domains
Scalability	High, large number of nodes	Very High, any number of nodes, densities	Very High, any number of nodes, densities and complexity
Bootstrapping	Reduced time to 70%	Reduced time to 40%	Reduced time to 10%
Convergence time of the control plane	Time reduced to 70%	Time reduced to 40%	Time reduced to 10%
Signalling overhead in reconfiguration	Reduced to 90%	Reduced to 75%	Reduced to 75% in multitenant environments

### Pervasive network control

### Selected KPI forecasts Terrestrial Radio Communications

Short-term Evo. ~2025	Medium-term Evo ~2028	Long-term Evo. ~2030
Benchmark strategy including data set and models	Monitoring and attack detection EU-wide strategy	Data protection strategy with response time and robustness outperforming attackers capabilities

### Attack detection and Response in Cybersecurity Incidents

### Trust in ICT Infrastructure

Short-term Evo. ~2025	Medium-term Evo ~2028	Long-term Evo. ~2030
5G systems & services certification frameworks, Basic security level exposure with generic security attributes defined	Methodologies and tools for composition and time evolution of certified perimeters (systems & services)	Evolutive approach for data and disruptive technologies

Target KPI	Current	Short-term Evo ~2025	Mid-term Evo ~2028	Long-term Evo ~2030
Spectrum <sup>1</sup>	5THz	15THz	30THz	50THz
Port speed <sup>2</sup>	400Gb/s	1.6Tb/s	3.2Tb/s	6.4Tb/s
Bandwidth <sup>3</sup>	<75GHz	<300GHz	<600GHz	<1200GHz
Line capacity <sup>4</sup>	25Tb/s	200Tb/s	600Tb/s	1.5Pb/s
Node capacity <sup>5</sup>	150Tb/s	1.2Pb/s	3.8Pb/s	9Pb/s
PON speeds	100Gb/s	50Gb/s	100Gb/s	>200Gb/s
User data rate <sup>6</sup> (consumer)	100Mb/s	~1Gb/s	>2.5Gb/s	>5Gb/s
User data rate <sup>6</sup> (business)	1Gb/s	~10Gb/s	>25Gb/s	>50Gb/s
Latency <sup>7</sup>	<1ms	<100us	<10us	<1us
Power consumption <sup>8</sup>	100% (baseline)	40%	30%	20%
Service provisioning	Hour	Min	Second	Sub-second
Network operations	Operator-controlled, reactive	Intent-based, proactive	Self-diagnosing	Self-optimizing

### KPIs for optical communications

ative List

## REVERSE PARAMETERS:

## IDENTIFYING R&amp;D CHALLENGES (WIRELESS)



	User Data Rate	Latency		Reliability	Connection Density	Energy Efficiency	Positioning	Coverage Area Probability	Mobility
		C-Plane	U-Plane						
Multi-Sensory XR	1000%+				100%+				
Volumetric Media	1000%+					100%+			
Connected Industry			100%+	1000%+			1000%+		
Auto and Swarm		100%+							
Extreme Coverage								~1	100%+
Extreme Gaming							1000%+		
Ultra Low Power IoT		100%+			100%+	100%+			

## AND FINALLY AN ACK



**Rui L. Aguiar (editor)**, Ahmed Akan, Ian F. Akyldiz, Marco Andrenacci, Miguel Ángel Vázquez, Antonio Arcidiacono, Jordi Arjona, Jorge Arjona Aroca, Achim Autenrieth, Arturo Azcorra, Nikolaos Bartzoudis, Didier Belot, Jose Manuel Bernabeu Auban, Carlos Jesus Bernardos Cano, Sébastien Bigo, Gregory Blanc, Nicola Blefari-Melazzi, Marja-Matinmikko Blue, Harald Bock, José Bonnet, **André Bourdoux (editor)**, Raffaele Bruno, Albert Cabellos, Giuseppe Caire, Gino Carrozzo, Roberto Cascella, Ramon Casellas, Francky Catthoor, Fabio Cavaliere, Nicolas Chuberre, Claudio Cicconetti, Nicola Ciulli, Daniel Corujo, **Emmanuel Dotaro (Editor)**, Falko Dressler, Jan Craninckx, Filippo Cugini, Francesco D'andria, Franco Davoli, Tomaso De Cola, Hervé Debar, Thomas Delamotte, Paolo Dini, Rui Dinis, Jordi Domingo-Pascual, Michael Eiselt, **Jörg-Peter Elbers (Editor)**, Omar Elloumi, Barry Evans, Gerhard Fettweis, Sérgio Figueiredo, Valerio Frascaola, Ronald Freund, Alex Galis, Ana Garcia, Lorenza Giupponi, Stein Gjessing, Helmut Grießer, Harald Haas, Said Hamdioui, **Artur Hecker (Editor)**, Tim Hentschel, David Hillerkuss, Marco Hoffmann, Bengt Holter, Marko Höyhty, Hans-Peter Huth, **Jyrki Huusko (Editor)**, Riku Jäntti, Jenny Johnson, Josep M. Jornet, Liu Ju, Ana Juan, Charalampos Kalalas, Alexandros Kaloxylas, Gour Kar, Georgios Karagiannis, Holger Karl, Andreas Knopp, Raymond Knopp, Florent Krichner, Evgeny Kucheryavy, Eva Lagunas, Yao-Hong Liu, Michele Luglio, Antonio Manzalini, Mario Marchese, **Josep Martrat (editor)**, Cyril Michel, Enzo Mingozzi, Marco Miozzo, **Werner Mohr (editor)**, Alain Morad, Raul Muñoz, Maziar Nekovee, Peter Ossieur, Daniel Pakkala, José António Palma, Aarno Pärssinen, Andrea Passarella, Ana Pérez, Luis Perez-Freire, Ullrich Pfeiffer, Yvan Pointurier, **Ari Pouttu (editor)**, Ayman Radwan, Parm Raewal, Nandana Rajatheva, Aurora Ramos, Enrico del Re, Johannes Riedl, Elisa Rojas Sánchez, Marco Ruffini, Daniel Sáez-Domingo, Natalie Samovich, Jose Manuel Sanchez, Pouria Sayyad Khodashenas, Sachin Sharma, Colja Schubert, Egon Schulz, **Kari Seppänen (editor)**, Pablo Serrano, Alena Siarheyeva, Dimitra Simeonidou, Muhammad Zeeshan Shakir, Apoorv Shukla, Rute Sofia, Hui Song, Alexandros Stavdas, Juergen Sturm, Panagiotis Trakadas, Dirk Trossen, Attilio Vaccaro, Alexandre Valentian, **Alessandro Vanelli-Coralli (editor)**, Angeles Vazquez-Castro, Luis Velasco, Ovidiu Vermesan, Panayiotis Verrios, Piet Wambacq, Rainer Wansch, Michael Welzl, Joerg Widmer, Henk Wymeersch, George Xilouris, Dehao Wu, **Wen Xu (Editor)**, Seppo Yrjölä, Florian Zeiger, Martina Zitterbart, Zhi Zhou,

## THE NEXT STEPS



- Current SRIA version (2.0) is being used to finalize the content of the upcoming workprogram.
  - Document and webinar available
- But there is already a noticeable change on the perception of research for next years: “6G” is now the dominant attractor across the community
- By November 2021 we will start the new version of SRIA
  - Week of 22nd November – several events being planned! – RESERVE THE DATE
  - Summit to be organized with invited and open contributions ( ≠ papers)
  - Expert group to organize editing process
  - Open consultation by 2Q22
  - Conclusion by mid 2022



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**THANK YOU FOR YOUR ATTENTION**

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