Stream A

Stream A (RIA): Evolutionary path towards 6G

- Address mid- term requirements from policy objectives, societal needs, business orientations
- Support the European vision for societal challenges (e.g., digital inclusion and accessibility, unlock rural economic values and opportunities) & Green deal objectives
- Enable open connectivity and service platform evolution with reduced energy consumption and lower operational and ecological costs
- Prepare for new advanced user services (e.g., immersive communication, holographic telepresence & AR/VR etc.),

Develop the technologies to support mid-term functional and non-functional properties & integrate multiple enablers from related domains (HPC, Cyber-security, AI/ML, IoT)

Stream A

Stream A (RIA): Evolutionary path towards 6G

- Focused on a defined technical area per proposal
- Focus on **short/mid-term KPIs**
- Target **impact in standardization**
- **Implementation concept:** one project for each topic – all topics considered together constitute a system

Stream A projects will define and establish system level interfaces to be able to realize a unified vision of pre- 6G systems, with the support of the Coordination and Support Actions (CSAs)

AI techniques are expected to be widely explored across Stream A projects.

Such open data sets (e.g., date of release, its scope, and the dimension and diversity of data) will be considered as part of the impact evaluation criteria for relevant projects that aim to explore AI techniques.


NETWORLD

Sep 2020

Strategic Research and Innovation Agenda 2021-27

European Technology Platform NetWorld2020

"Smart Networks in the context of NGI"

2020

Stream A: 5G Evolution - RIA

- Green radio technology
- Ubiquitous radio access
- Sustainable capacity networks
- Evolved architecture for global green systems
- Edge computing evolution
- Trustworthy and Reliable end-to-end connectivity software platforms
- Real-time Zero-touch service technologies

Stream A: 5G Evolution - RIA

Green radio technology

Expected Outcome:

- Technologies for basic building blocks that go beyond the current 5G wireless system specifications, supporting improved wireless communications' efficiency and capabilities in increasingly dense environments and number of end-devices.
- Support for a multitude of services, including further advancements on enhanced Mobile Broadband (eMBB), massive machine type communications (mMTC), Ultra-Reliable Low-Latency communication (URLLC), Vehicle-to-everything (V2X), etc., with significantly more stringent requirements, such as multi-Gbps data throughput, high reliability, and security, as well as high degrees of adaptability, while addressing energy efficiency.
- Identification of technologies, best practices, methods, and tools, for maximising performance vs energy consumption, addressing societal questions, such as EMF impact and urban impact of antennas, especially for city dense environments.
- Support to direct impact in standardization.

Stream A: 5G Evolution - RIA

Green radio technology

Proposed set of topics:

- Signal processing techniques and technologies for Evolved RAN
- Below 6GHz and above 26GHz
- Solutions for the physical and the higher RAN layers
- Cell free and software-based radio systems
- Disaggregated RAN solutions
- Hardware acceleration through micro-electronics
- Spectrum re-farming
- Advances for mmWave
- Massive MIMO solutions
- Energy efficient solutions &
- EMF Impact

Stream A: 5G Evolution - RIA

Ubiquitous radio access

Expected outcome:

- Availability of 5G technology and systems economically deployable in low-density environments or areas where economic coverage is challenging.
- Deeper integration of terrestrial and Non-Terrestrial Networks (NTN) towards easier operations of multi technology RAN implementations.
- Accelerate 5G deployment and address key societal challenges while creating new market opportunities for the terrestrial and satellite eco-system enabling service provision to vertical industries

Stream A: 5G Evolution - RIA

Ubiquitous radio access

Proposed set of topics:

- Integration of terrestrial networks and NTN for ubiquitous wide-area wireless access
- Consolidated NTN architectures (LEO/MEO/GEO) in the context of the 5G advanced Roadmap
- Ubiquitous connectivity in a heterogeneous environment (terrestrial and non-terrestrial)
- Improvements of existing air-interfaces to provide ubiquitous connectivity (accessing through terrestrial and non-terrestrial links)
- Reconfigurable radio access network that can be dynamically adjusted to changing conditions and requirements
- Address the improvements of RAN systems considering integrated non-terrestrial component for beyond 5G, and dynamic access methods (such as device to device (D2D)
- Radio access management techniques (for both terrestrial and NTN), exploring distributed ultra-massive antenna deployment (for both terrestrial and NTN) towards user-centric communications (e.g., cell-free systems).
- Address spectrum re-use challenges
- AI/ML to address the potential complexity of such architectures

Stream A: 5G Evolution - RIA

Sustainable capacity networks

Expected Outcome:

- Improve technologies to scale up network capacity and control latency while at the same time limiting energy consumption, with improved reliability, safeguarding the network infrastructure against data leakage and unexpected service outages (or other form of hazards, natural or man-made) in multi-stakeholder scenarios.
- Enhanced capability transport networks capable to cope with evolving end-user requirements, increasing and denser coverage of mobile for future cellular or cell-free communications.
- Advances in network control, automation, and autonomy, paving the way to truly self-managed networks.

Stream A: 5G Evolution - RIA

Sustainable capacity networks

Proposed set of topics:

- Cost-effective, high-capacity optical networking technologies, that will lead to an interoperable low-cost converged packet-optical transport
- Novel optical transmission and switching schemes and architectures to provide innovation on the forwarding plane (potentially leading to the standardization of new semantic descriptions, information models, and routing protocols for management and control),
- Pervasive telemetry to allow advanced autonomous network operation and optimization taking energy consumption minimization into account for software-defined environments

Stream A: 5G Evolution - RIA

Evolved architecture for global green systems

Expected Outcome:

- Reduced energy and carbon footprint of the evolved 5G network, through de-carbonisation of the evolved networks and increased renewable penetration capabilities within SNS user “vertical” domains.
- Extension of the 5G Service Based Architecture (SBA) applicability to an extensive value chain covering a holistic system covering data communication, distributed computing, and data storage, extending the communication infrastructure into a sustainable, interconnected, greener end-to-end intercompute system, supporting all types of services and interconnected networks.

Stream A: 5G Evolution - RIA

Evolved architecture for global green systems

Proposed set of topics:

- Architectural transformation, targeting energy-efficiency, using the flexibility that the Service-Based Architecture (SBA), introduced in Rel15 (TS23.501)
- Improved architectures considering all elements from the terminal to the data centre communicating efficiently while the overall system being able to jointly optimize their energy consumption
- Extension of the 5G Service-Based Architecture (SBA) – focus on the core network control plane towards a unified coverage of system design and runtime composition/resolution, incorporation of new types of compute resources (e.g., at the edge) and Multicast/Broadcast services
- Definition of adequate interfaces for integrating compute, transport and RAN considerations in a globally optimized system
- Transport extensions to the underlying network infrastructure
- The efficient collection of data (e.g., facilitate AI) expanding on trends in SDOs (e.g., 3GPP, ETSI)
- Address the seamless operation of Public and Non-Public interconnected networks

Stream A: 5G Evolution - RIA

Edge computing evolution

Expected Outcome:

- A clear technological strategy for edge integration into a cloud continuum offering opportunities for European cloud/edge technology suppliers and supporting various edge/access integration scenarios, (e.g., NTN).
- Edge architecture and technologies supporting most demanding applications and use cases such as high automation levels for autonomous driving, immersive applications such as digital twins, advanced XR/VR, hologram applications, requiring extremely low latencies and/or very high-capacity justifying edge processing and computing.
- Open, secure, distributed, possibly decentralised, edge computing architectures and implementations optimally integrating heterogeneous communications and networking in edge computing for IoT, with a value chain perspective opening innovative IoT applications and control.

Stream A: 5G Evolution - RIA

Edge computing evolution

Proposed set of topics:

- The work brings virtualization and disaggregation in different segments (home, edge, datacentre, NTN ground and on-board flying nodes), under the scope of multi-access edge computing concepts
- address functional placement and optimised computing distribution capabilities as a function of requirements emerging from ultra-low latency, ultra-high-capacity immersive applications
- Open secure, distributed edge computing architectures
- AI and distributed security to protect transmitted data at the edge computing servers based on ledger or other technologies may be considered
- Data and control plane solutions for a multi-edge architecture
- New IoT device management techniques to operate over distributed architectures for IoT systems based on an open device management ecosystem
- Novel programming models and engineering practices (e.g., split-computing), preferably applicable to open software environments, enabling the flexible distribution and migration of computation tasks
- Flexible hardware platforms and programming abstractions
- Demonstrate the provision of high-quality services (including reliable Operations Support System (OSS) mechanisms)
- Provide the necessary openness --> edge computing as a service innovation platform

Stream A: 5G Evolution - RIA

Trustworthy and Reliable end-to-end connectivity software platforms

Expected outcome:

- Novel technologies/methods for ensuring Trust and Reliability, evolving 5G, in a very distributed multi-stakeholder context, extending the concept of edges from small CPEs and IoT devices to regional datacentres, enabling full control over end-to-end data flows and trust on the execution environments.
- Further evolving security of 5G towards the notion of building and maintaining Trust in deployed and interconnected 5G systems and services.
- An open, flexible architecture, for evolved 5G, able to cope with widely distributed, federated, and dynamic systems for data processing, data storage and communication tackling data reliability challenges.
- The outcome should build trust and reliability, significantly advanced beyond the baseline security measures of 5G

Stream A: 5G Evolution - RIA

Trustworthy and Reliable end-to-end connectivity software platforms

Proposed set of topics:

- reliability/trust challenges created by fully virtualized solutions, increased network programmability, extended network exposure and tight integration to service providers and non-public networks spanning the business actors of the value-chain
- Secure and reliable technologies for efficient containers and smart and secure container orchestration, with reliable software virtualization, with fast instantiations and mobility support
- Flexible security policies in very distributed settings
- Novel requirements from challenging verticals, jointly using secure software engineering and operational procedures
- Better tools for initial ‘security by design’ and for creation of “safer” code
- Virtualisation of security functions (Protection, detection, remediation) and Exposure and integration of security services (MSSP, NOC-SOC interactions)
- Adherence with and improvements of efficient data sovereignty strategies in different domains (including bridging public and private networks)
- The definition of a security verification policy and associated credentialing of the secure communication system capability

Stream A: 5G Evolution - RIA

Real-time Zero-touch service technologies

Expected Outcome:

- Availability and characterisation of a service framework and associated technologies, addressing software tools and topology aware processes to deploy functions at the appropriate level of a cloud continuum. The target is to develop effective service deployment and management schemes that will, easily support new vertical services
- Architectures and technologies supporting verifiable actions/decisions without human intervention or without a previous acquired knowledge on the type of response/interaction that is going to happen.
- Availability of service stack enabling reduced energy consumption for service deployment, management and operations.

Stream A: 5G Evolution - RIA

Real-time Zero-touch service technologies

Proposed set of topics:

- Enable service providers to act as ‘platform operators”
- Hide inherent complexities from the creation and management of new services, while ensuring the highest level of trustworthiness to the final users/service developers
- Enable improved efficiency in service support, also responding to the ambitions of lower energy systems
- Include open-source technologies for software development
- Methods and procedures to guarantee
  - a) optimal energy performance
  - b) user transparency for complex distributed platforms
  - c) support vast numbers of end devices requiring low energy (e.g., IoT, consumer electronic, medical devices, ...)