HORIZON-CL4-2022-DIGITAL-EMERGING-02-17/18/19/20/22

Graphene: Europe in the lead

- starting point is the Graphene Flagship
- Build on its achievements, pursued R&I activities and accelerate the technology developments
- concrete innovation opportunities and production capabilities
- strong supply and value chains in graphene and 2DM in Europe.

Graphene: Europe in the lead

5 topics: RIAs/IAs (4 topics) and 1 CSA, 16 June – 16 Nov 2022, 43.5m€

- Electronics: New generation of advanced electronic and photonic 2D materials-based devices, systems and sensors (RIA, 16,5M€)
- Energy: 2D materials-based devices and systems for energy storage and/or harvesting (RIA, 9M€)
- Biomedical: 2D materials-based devices and systems for biomedical applications (RIA, 6M€)
- Composites: 2D-material-based composites, coatings and foams (IA,9M€)
- CSA supporting the coordination of the Graphene Flagship projects (3M€)

HORIZON-CL4-2022-DIGITAL-EMERGING-02-17

New generation of advanced electronic and photonic 2D materials-based devices, systems and sensors (RIA)

We are looking for:

- ✓ New technological solutions providing significant advances towards the integration of 2DM technology and the emergence of competitive value chains

1. development of 2DM-based devices and systems bringing 2DM technology one step further towards the integration in current technologies
2. 2DM-based sensors, electronic and photonic devices and systems
3. Demonstrate added-value compared to current technologies
4. Modelling, design, manufacturing and characterisation
5. Assess routes for integration and indicate plans to work with the 2D-EPL.

HORIZON-CL4-2022-DIGITAL-EMERGING-02-17

New generation of advanced electronic and photonic 2D materials-based devices, systems and sensors (RIA)

We are looking for:

1. Integrate the value chain and manufacturing technologies
2. Include activities for future exploitation of results
3. Start at TRL3-4 and achieve TRL 5
4. Contribute to the governance and coordination of the Graphene Flagship initiative.

Indicative budget: 16.5M€

Expected EU contribution per project: 16.5M€

HORIZON-CL4-2022-DIGITAL-EMERGING-02-18

2D materials-based devices and systems for energy storage and/or harvesting (RIA)

We are looking for:

- ✓ Energy storage devices and systems with demonstrated added-value
- ✓ New solutions for portable energy sources

1. Solutions demonstrating the added value of 2DM based energy storage devices and systems
2. Structural batteries and structural supercapacitors
3. Devices for energy conversion

HORIZON-CL4-2022-DIGITAL-EMERGING-02-18

2D materials-based devices and systems for energy storage and/or harvesting (RIA)

We are looking for:

1. Integrate the value chain and manufacturing technologies
2. Include activities for future exploitation of results
3. Start at TRL3-4 and achieve TRL 5
4. Contribute to the governance and coordination of the Graphene Flagship initiative.

Indicative budget: 9M€

Expected EU contribution per project: 9M€

HORIZON-CL4-2022-DIGITAL-EMERGING-02-19

2D materials-based devices and systems for biomedical applications (RIA)

We are looking for:

✓ New technology solutions based on 2DM for biomedical applications.

1. Devices and systems building of the multi-functionality of 2DM and demonstrate their advantages.
2. Address how the devices and systems will reach the clinic
3. Need to gather multidisciplinary teams
4. Potential application areas: diagnostic, therapeutic devices, brain-computer interfaces, medical imaging, drug delivery…
5. Safety aspects

HORIZON-CL4-2022-DIGITAL-EMERGING-02-19

2D materials-based devices and systems for biomedical applications (RIA)

We are looking for:

1. Include activities for future exploitation of results
2. Start at TRL3-4 and achieve TRL 5
3. Contribute to the governance and coordination of the Graphene Flagship initiative.

Indicative budget: 6M€

Expected EU contribution per project: 6M€

HORIZON-CL4-2022-DIGITAL-EMERGING-02-20

2D-material-based composites, coatings and foams (IA)

We are looking for:

- ✓ New multifunctional recyclable materials enabling solutions to environmental issues.

1. 2DM composites, coatings and foams mainly addressing environmental issues.
2. Development of lightweigh composites and coatings wit hkey functionalities
3. Metal 2DM compposites enabling ulralow frictions
4. 2DM foams for catalytic hydrogen generation and storage

HORIZON-CL4-2022-DIGITAL-EMERGING-02-20

2D-material-based composites, coatings and foams (IA)

We are looking for:

1. 'Must' include Life Cycle Assessment and end-of-life materials management
2. Integrate the value chain and manufacturing technologies
3. Include activities for future exploitation of results
4. Start at TRL4-5 and achieve TRL 6-7
5. Contribute to the governance and coordination of the Graphene Flagship initiative.

Indicative budget: 9M€

Expected EU contribution per project: 9M€

HORIZON-CL4-2022-DIGITAL-EMERGING-02-22

Supporting the coordination of the Graphene Flagship projects (CSA)

We are looking for:

✓ A strong and coherent graphene and 2DM initiative.

1. Coordination of the projects selected under the heading « Graphene Europe in the lead ».
2. Support functions including: governance, community engagement, dissemination, communication, education and training, standardisation, innovation, roadmap activities.
3. Interactions/coordination with relevant national and regional initiatives and projects in the domain.
4. Dialogue with relevant international programmes.

Graphene: Europe in the lead – topic evolution

3. Is this new or has it been called before?
   - Continuation of the Graphene Flagship
   - Significant change in implementation; FPA/SGAs vs RIAs/IA and one CSA
   - There are several topics in the current WP, outside of « Graphene: Europe in the lead » where 2DM based technologies can compete.

Graphene: Europe in the lead – topic evolution

4. Current project portfolio
   - Graphene Flagship
     https://graphene-flagship.eu/
     Annual reports: https://graphene-flagship.eu/research/annual-report/
   - 2D Experimental Pilot Line
     https://graphene-flagship.eu/innovation/pilot-line/

Graphene: Europe in the lead – Key actors

5. Who are the types of main stakeholders that are addressed?

   Academic and industrial partners

6. Is there a key group of actors (eg. Partnership or other) driving this?

   The Graphene Flagship consortium is a key group: https://graphene-flagship.eu/collaboration/our-partners/

Graphene: Europe in the lead

7. Are there any additional / background documents?
   - Consultation workshop, Jan. 2020, report: https://digital-strategy.ec.europa.eu/en/library/consultation-report-graphene-and-related-materials-now-available
8. Do you have information about future trends, emerging initiatives, roadmaps, key players in this area?
   - Technology and Innovation roadmap: https://graphene-flagship.eu/innovation/industrialisation/roadmap/

Upcoming events / information days

9. Please list upcoming information days and other events of relevance to this area
   - Graphene Week 2021 (20-24 Sept.)
   - Info day, Cluster 4: 01 Dec. 2021, 10h30 – 11h45
     https://ec.europa.eu/info/research-and-innovation/events/upcoming-events/horizon-europe-info-days/cluster-4_en

HORIZON-CL4-2022-DIGITAL-EMERGING-01-26

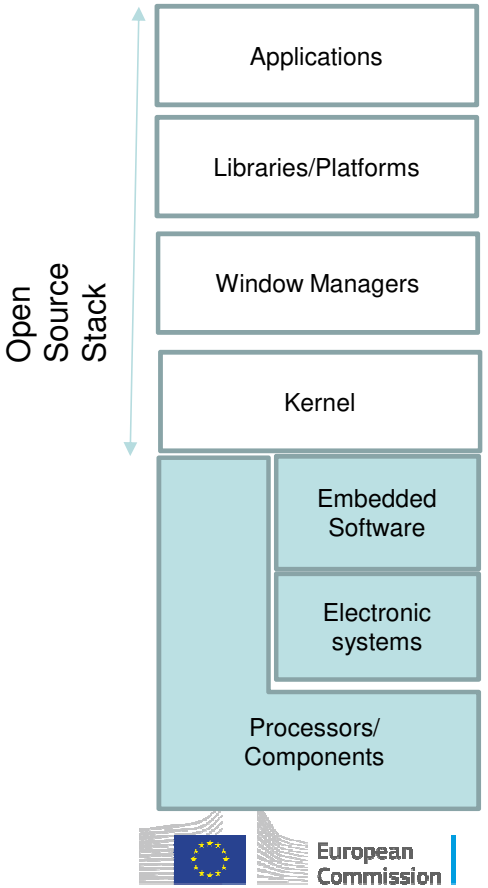
HORIZON-CL4-2022-DIGITAL-EMERGING-01-26: Open source for cloud-based services

What are we looking for?

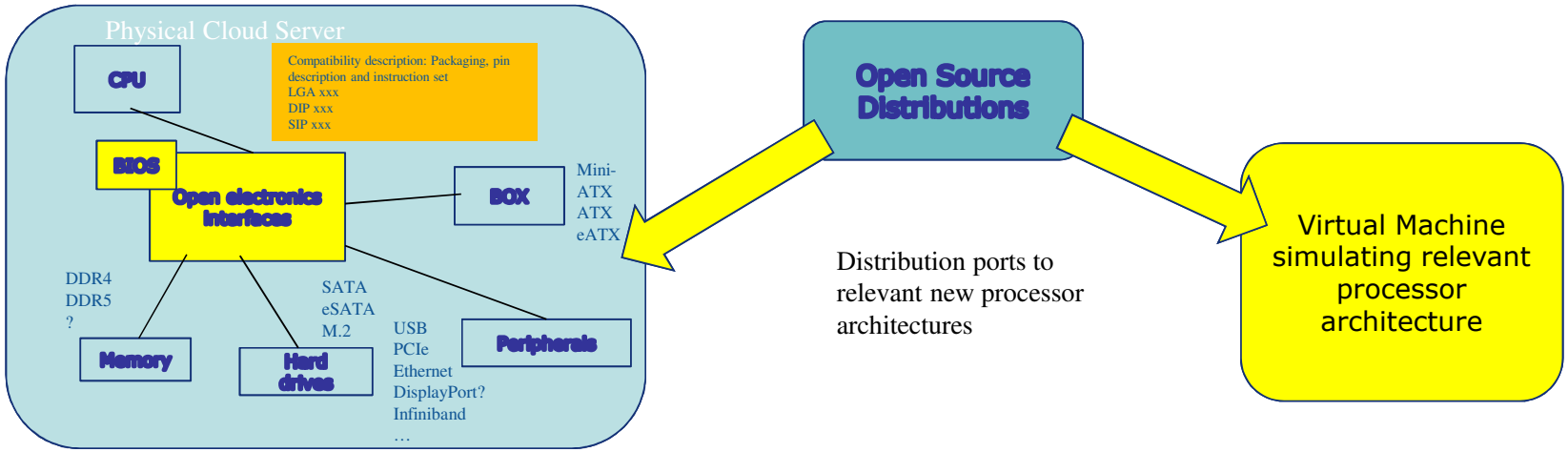
- **Type of Action: Research and Innovation Action (RIA)**

Opening: 23 November 2021	**Deadline: 05 April 2022**
Budget: EUR 22 million	**EU contribution per project:** EUR 4-6 million

- **Expected Outcome:**
  - **Virtual environments, methods and tools**
    - Simulation of targeted architectures
    - Development and coordination with relevant software distributions
  - **Open source interfaces that permit the deployment of tested stacks on the outcomes of European processor initiatives. Proposals should address at least one of these points:**
    - Open hardware interfaces
    - Software to provide the basic initialization



What is wanted:



What is not wanted:

- TRL 1-3 developments
- Standalone modules
- Development of Interfaces for unimplemented services
- Work on dominant market-established processing architectures

Is this new or has it been called before?

HE CL4 WP2022

Horizontal Research

HE CL4 WP2022

HE CL4 Scoping

Vertical Research and Innovation

US/CN Large Cloud Service Providers

Cloud

Edge

Computing Continuum

Far Edge/Device

EU HW/SW Companies, Service Providers and System Integrators

Destination 4

2022

Open Source for **Cloud based services**
(TRL 2-5, 4-8M€ pp)

- Virtual environments, methods and tools for deployment of full Open Source stacks compiled for new processing architectures
- OS distribution coordination (new target architectures)
- Open hardware interfaces for new processing architectures
- Basic initialization software up to the OS boot

Destination 3

2022

Environments and tools for **Decentralised Intelligence** at the edge
(TRL 2-5, 4-8M€ pp)

- Programming environments for groups of devices
- Swarm intelligence
- Tactile Internet
- Reduce complexity
- AI-based tools
- Interoperability: no vendor lock-in
- Reusability
- Agility

2021

Future European Platforms for the Edge: **Meta Operating Systems**
(TRL 4-5, 8-12 M€ pp)

- "Meta" operating Systems: to orchestrate edge & devices
- Strong computing capacity @ edge and far edge
- Intelligence at egde/device
- Modularity/Containerisation
- Refactoring/Encapsulasation of legacy
- Separate data/cloud/app
- Virtualisation of HW
- Resource efficiency
- AI inference/real-time support
- App aggregators
- Trusted Computing Base

2022

Cognitive Cloud Framework: AI-enabled Computing Continuum from Cloud to Edge:
(TRL 2-6, 4-6M€ pp)

- Continuum management
- Multi-Cloud approach
- AI-based techniques
- Optimisation data/compute
- Dynamic load balancing
- Seamless integration from cloud to far edge
- Security and data privacy
- Energy efficiency

2021

CSAs: Co-ordination and roadmapping

Planned for 2023

Emerging Smart **Industrial IoT and Edge Computing Systems**:

- Gradual up-take of emerging concepts
- Instantiation
- Customisation
- Scalability
- Exploring the limits
- Integration in open sectoral platforms
- Ecosystems
- Use cases and pilots
- Energy, Home, Industry 4.0, Mobility, Agriculture, Health, Smart Communities

Next generation embedded microprocessors

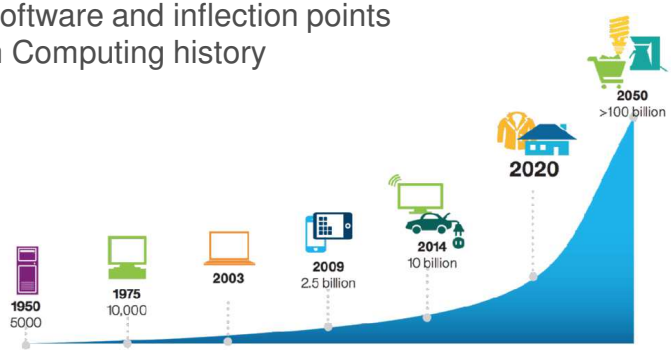
Smart Edge / Devices Smart cyber-physical systems

Connectivity: 5G, ZIGBEE, BT, WLAN, LPWA

Relevant projects

- *Topics funded under Horizon 2020 WorkProgramme 2018-20*
  - *ICT-15-2019 Cloud Computing*
  - *ICT-16-2018 Software Technologies*
  - *ICT-40-2020 Cloud Computing: Towards a smart cloud computing continuum*
  - *ICT-50-2020 Software Technologies*
- *European Processor Initiative*
  - *New relevant Processing architectures*

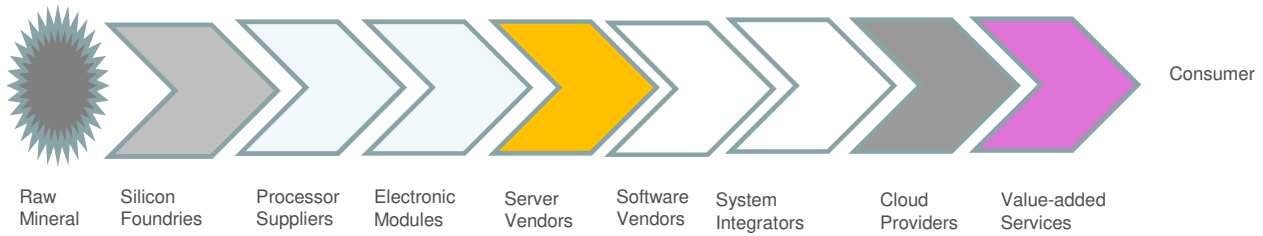
Software and inflection points in Computing history



Relevant Stakeholders

- *Electronics industry*
- *Software industry*
- *Universities*
- *Supercomputing centers*
- *Data centers*
- *Stakeholders in the area of the EPI*

Cloud Value Chain



Future Outlook and policy context

EU Data Strategy

Cloud actions:
- Cloud Rulebook
- Co-Investments in cloud-to-edge services, cloud federation and marketplaces.

Data actions:
- New legislation (Data Governance Act & Data Act)
- Co-investments in EU data spaces

Chips Act

DEP

IPCEI* on Next Generation Cloud
*(*Important Project of Common European Interest)*

EUROPEAN ALLIANCE FOR INDUSTRIAL DATA, EDGE AND CLOUD

Coordination

Federation & interoperability standards

GAIA-X

Use cases; technical architecture

European Common Data spaces

HORIZON-CL4-2022-DIGITAL-EMERGING-01-30

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

What are we looking for?

Expected outcome

- Availability of **European capabilities** for enabling **hardware, computing, signal processing technologies** for beyond 5G (B5G) and future 6G infrastructures in the context of disaggregated, virtualized networks, for both small cell networks and cloud-based macro RANs.
- Availability of **European capabilities for B5G/6G computing** based on new computing architectures for Base station including accelerators (e.g. FPGA's) capable of supporting even the most demanding 5G/6G processes in cloud servers and white box base stations or routers.

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

What are we looking for?

Scope (1):

- B5G and 6G Base station computing and processing capabilities **enabling the most demanding high performance, real time Radio Access Network (RAN) functions** such as dynamic spectrum sharing in the context of disaggregated RAN architectures. It includes acceleration capabilities for real time virtualisation engines.
- **Future RAN computing architectures and technology** implementable in cloud or distributed computing platforms whilst addressing the current Open RAN limitation, notably energy efficiency and security. It supports 5G spectrum implementation above C band and future 6G spectrum capabilities as well as massive MIMO implementations. ASIC implementation benchmark may be taken as a target for performance validations.
- **Open computing platform supporting future RAN disaggregation and virtualization and enabling an open multivendor architecture**, on which large numbers of European equipment vendors may innovate. Openness also enables **intelligent RAN real time management**, notably through Machine Learning processes enabling key performance optimisation, in particular spectrum sharing.

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

What are we looking for?

Scope (2):

The proposal should include a clear European strategy for the **emergence of a European capability in this communication-computing domain** where Europe is today not at the forefront. The strategy is expected to **leverage new opportunities** offered by the trend **towards network disaggregation and cloud implementation of functions**. It offers a clear path towards exploitation and industrial commitment.

For this activity, a clear **complementarity strategy with relevant actions** like Key Digital Technologies Joint Undertaking, Smart Networks Services Joint Undertaking, the Important Project of Common European Interest (IPCEI) on micro electronics and communication is sought.

It is considered that participation of key European industrial players and RTO's from the communication domain, the micro electronic domain, as well as key SME's in these domains are needed.

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

What are we looking for?

Specific conditions:

- Expected EU contribution per project:
  The Commission estimates that an EU contribution of around **13 million EUR** would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
- Indicative budget: The total indicative budget for the topic is **13 M€**
- Technology Readiness Level: **TRL 2-3 to TRL 4-5**
- Type of Action: **Research and Innovation Actions**
- Deadline: **5th April 2022**

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

What are we looking for?

- Strong contributions from the microelectronics supply chain
- Gaining leadership in development through forward-looking research
- Create an advanced microelectronics supply chain for European sovereignty
- Stimulate the emergence of a European source of hardware components/processors/DSP/accelerators as will be needed to run the processes of disaggregated RAN infrastructures

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30
European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

What do you NOT want?

- The outcome is primarily on EU hardware computing capabilities (e.g. computing, processors, DSP), not to dedicated software capabilities.

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

Current project portfolio

- The call logic is placed in the context of an extension of the work and results of the **Corenect CSA** project, as an important tool to design our approach towards enabling hardware technologies (computing, DSP, memories, chipset, sensors..) in support of future connectivity infrastructures, while bridging the telecom domain and the component domain (in particular SNS and KDT)

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

Who are the types of main stakeholders that are addressed? Who are the leading players?

- Micro-electronics supply chain players and Communication supply chain actors
- Network Operators/Vertical industries (user requirements steering)

Is there a key group of actors (eg. Partnership or other) driving this?

- 5G PPP
- Corenect project
- Networld ETP (partially)
- Smart Network and Services (6G) partnership https://digital-strategy.ec.europa.eu/en/policies/smart-networks-and-services-joint-undertaking

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

Future Outlook - Do you have information about future trends, emerging initiatives, roadmaps?

- Mitigate the risk that future lock in position in the Open RAN ecosystem will emerge from the microelectronics/component underlying technology, by stimulating a European offer at component level.

Key initiatives in the domain include:

- ORAN alliance
- TIP project
- IPCEI micro electronics and Cloud
- Industry initiatives like Intel FlexRAN, ARM, etc.

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

Upcoming event:

- Horizon Europe Cluster 4 Info Day, on 1st December 2022: https://ec.europa.eu/info/research-and-innovation/events/upcoming-events/horizon-europe-info-days/cluster-4_en

HORIZON-CL4-2021-DIGITAL-EMERGING-01-30 European Enabling technologies for Beyond 5G/6G RAN disaggregated architectures (RIA)

More information

- Funding & tenders (europa.eu)
- 5G PPP ongoing actions: https://5g-ppp.eu/
- Industry proposal SNS: https://6g-ia.eu/sns-horizon-europe/
- SRIA: https://www.networld2020.eu/sria-and-whitepapers/
- Single Basic Act – Commission adoption: https://ec.europa.eu/info/news/commission-welcomes-approval-10-european-partnerships-accelerate-green-and-digital-transition-2021-nov-19_en

HORIZON-CL4-2022-DIGITAL-EMERGING-01-39

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

What are we looking for?

Expected outcome

- The work will contribute to
  i. a reinforced European leadership in **connectivity, devices and service infrastructure**, with European capabilities in shaping future **connectivity standards**,
  ii. a digital and green transitions towards **low carbon footprint of connectivity platforms**
  iii. enabling **most demanding industrial use cases** requiring very high grade of **QoS and performances** (real-time sub-millisecond latency and secure applications)

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

What are we looking for?

Expected outcome

- The research covers enabling technologies for the long term objective of
  i. **ultra low energy networks** and corresponding EU industrial capability for end-to-end all-optical communications with no electro-optical conversion
  ii. **ultra high security over fibre nets** (e.g quantum grade beyond today's range limitation). Complementary protocol level work may be considered to alleviate IP limitations, making networks deterministic, drastically reducing energy needs whilst increasing performances in terms of security, control by applications of differentiated features, and implementability as "Network on a Chip".

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

What are we looking for?

Scope:

- Technology for **ultra high energy efficiency and capacity**, with optical functions replacing more power-hungry electronics, towards the realisation of **end-to-end all-optical networks**. It aims at replacing electro-optical interfaces and their management by lower power optical interfaces and targets the extension to new wavelength bands to reach rates of 10 Terabit/s for optoelectronic Interfaces and over 1 Petabit/s for optical fibre systems.
- Technology for **Ultra high security and reliability**, targeting improvements needed to reach end-to-end very high grade of security levels. Post-quantum replacements of current algorithms or provable and long-term secure data transmission of highly sensitive information is in scope, as well as novel. research directions like physical layer security for optical networks.

Use cases may target **highly integrated Radio-optical networks**, coping with a multiplicity of scenarios requiring different functional splits between different network parts, enabling optimal low cost operations of integrated fronthaul-backhaul and deterministic network behaviour for specific applications requiring ultra low latency.

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

What are we looking for?

Specific conditions:

- Expected EU contribution per project:
  The Commission estimates that an EU contribution of around **13 million EUR** would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
- Indicative budget: The total indicative budget for the topic is **13 M€**
- Technology Readiness Level: **TRL 2-3 to TRL 6**
- Type of Action: **Research and Innovation Actions**
- Deadline: **5th April 2022**

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

What are we looking for?

- Strong interactions between the telecom and the microelectronics/photonics communities, looking at a combined ”system and enabling technologies” perspective.
- Involvement of the security community for the ”ultra secure” part.

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

What do you NOT want?

- Monolithic community participation (e.g. only telecom)
- Short term solutions (all optical networks remain a long term prospect)

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

Current project portfolio-Established constituency

- 5G PPP projects on optical communications (e.g. Bluespace, Metro-Haul).
- Projects from the photonics partnership working on telecom optical networks (Working Group 1 of Photonic PPP)

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

Who are the types of main stakeholders that are addressed? Who are the leading players?

- Telecom, microelectronics community
- Security community

Is there a key group of actors (eg. Partnership or other) driving this?

- 5G PPP
- Networld ETP
- Smart Network and Services (6G) partnership https://digital-strategy.ec.europa.eu/en/policies/smart-networks-and-services-joint-undertaking

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

Upcoming event:

- Horizon Europe Cluster 4 Info Day, on 1st December 2022: https://ec.europa.eu/info/research-and-innovation/events/upcoming-events/horizon-europe-info-days/cluster-4_en

HORIZON-CL4-2021-DIGITAL-EMERGING-01-39
Ultra low energy and secure networks (RIA)

More information

- Funding & tenders (europa.eu)
- 5G PPP ongoing actions: https://5g-ppp.eu/
- Industry proposal SNS: https://6g-ia.eu/sns-horizon-europe/
- SRIA: https://www.networld2020.eu/sria-and-whitepapers/
- Single Basic Act – Commission adoption: https://ec.europa.eu/info/news/commission-welcomes-approval-10-european-partnerships-accelerate-green-and-digital-transition-2021-nov-19_en

HORIZON-CL4-2022-DIGITAL-EMERGING-01-35

HORIZON-CL4-2022-DIGITAL-EMERGING-01-35: Advanced characterisation methodologies to assess and predict the health and environmental risks of nanomaterials (RIA)

Projects are expected to contribute to the following outcomes:

- Develop high-resolution imaging methods for quantification and characterization of nanomaterials (e.g. nanoplastics) in complex matrices and determinations of their transformations in such environments.
- Increase availability of validated protocols to advance both nanosafety studies and material characterization.
- Ensure appropriate control experiments and more realistic in vitro models to address current gaps in nanotoxicology.
- Deliver reliable data and improved data reporting guidelines, supported by computational modelling, in order to allow the development of grouping and read across methods. Make use of open access database and using standards for data documentation (e.g. CHADA).
- Develop harmonized standardized test methods that can be used in a regulatory framework including test hazard assessment, biodegradability and sustainability for advanced nanomaterials.
- Increase the efficiency and effectiveness of materials and product development by reducing costs and time for product design, time-to-market and regulatory compliance

Indicative budget of the call: EUR 17.50 million
EU contribution per project: EUR 2–3 million
Type of Action: Research and Innovation Action
TRL: Start at 3 and achieve 5

European Commission

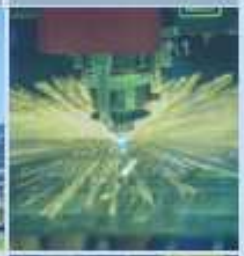
HORIZON-CL4-2022-DIGITAL-EMERGING-01-03/38

European Innovation leadership in electronics and photonics

2021	DIGITAL-EMERGING-01-06	**Advanced optical communication components (IA)**
	DIGITAL-EMERGING-01-07	**Advanced Photonic Integrated Circuits (RIA)**
	DIGITAL-EMERGING-01-31	**Functional electronics for green and circular economy (RIA)**
	DIGITAL-EMERGING-01-01	**Ultra-low-power, secure processors for edge computing (RIA)**
	DIGITAL-EMERGING-01-05	**Open Source Hardware for ultra-low-power, secure processors (CSA)**
2022	DIGITAL-EMERGING-01-03	**Advanced multi-sensing systems (RIA)**
	DIGITAL-EMERGING-01-38	**International cooperation in Semiconductors (CSA)**

What is Photonics?

European Commission

Types of Photonic Systems	Sensors & instruments	Camera & imaging systems	Communication systems	Screens, displays, projectors	LED, OLED, smart lighting	Photovoltaic systems	Laser & production systems
Photonic functions	Measure monitor	Acquire information	Transmit information	Deliver information	Provide light	Collect energy	Manufacture
Examples							
							

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European Commission

Advanced multi-sensing systems (RIA)

HORIZON-CL4-2022-DIGITAL-EMERGING-01-03

PROJECTS

- **RIA**
- EU contribution/project: **3-5 million Euro**
- Implement the photonics partnership

BUDGET

- 48 million Euro
- Call in **2022**

TRL (TECHNOLOGY READINESS LEVEL)

- **From 2 to 5** by the end of the project

Advanced multi-sensing systems – Scope

- **Breakthroughs in sensor systems:**

  Combining: Component development + System integration + Packaging + cost-effective manufacturing + Data Acquisition + Processing + Interpreting of vast amounts of sensory input data

- **Modular approach with interchangeable components operating in a platform environment**

- **The sensing functionality should build on technologies related to light**

- **Optional integration with:**

  Microelectronics, micro-nano-mechanical, micro-fluidic, magnetic, radio frequency, bio-chemical technologies

European Commission

Advanced multi-sensing systems - **Expected Outcome**

- Next generation multi-sensing **photonic and electronic** systems
- Support European **open strategic autonomy**
- Contribute to the **green deal** objectives
- Reinforce European **industrial leadership** in multi-sensing systems and components

- **increased integration of new functionalities, decreased size**
- **cost-effective manufacturing**
- **Key integration and packaging technologies**
- **Manufacturing value chains.**
- **High levels of reuse/repair/repurpose**
- **Recovery and recycling of waste and materials**
- **Reduce of power consumption by a factor of 2.**
- **healthcare and well-being**
- **environmental monitoring and protection**
- **transport and automated driving**
- **Manufacturing**
- **Aerospace and security**

Topic evolution

- In the past we called research on sensing in conjunction with specific application domains such as health, agro/food and manufacturing
- This time application range is open; yet the developed solution should be usable (with not too much effort) in different application domains
- For the project portfolio please see website of the partnership *www.photonics21.org* (WG 3-6)

Key actors

- RTOs
- Universities
- Industrial technology suppliers
- User companies

Background

Documentation

Photonics Downloads | Photonics21:

- SRIA
- Photonics Market Data and Industry Report 2020
- Photonics Partnership MoU

Event: EU HE Info Day on 01 December 2021

Cluster 4 - Digital, Industry & Space | European Commission (europa.eu)

Trends

- Miniaturisation
- Integration of functional elements on chip
- Modularisation
- Design tool/ simulation support

International cooperation in semiconductors

Expected outcomes

Proposals are expected to contribute to all of the following outcomes:

- *Advise the EC on joint actions with leading semiconductor countries (e.g. Japan, South Korea, Taiwan)*
- *Support the Commission to define and implement joint measures in the context of global value chains*
- *Provide support to the EC in the analysis (e.g. state-of-the-art, emerging technologies…) of cooperation actions*

International cooperation in semiconductors

Scope

Within the context of semiconductor and semiconductor-based photonics (e.g. Silicon photonics), the CSA will address the following activities:

- *Preparation of a regional mapping of industrial strengths and gaps*
- *Identification of emerging opportunities (e.g. technologies, approaches)*
- *Definition of research areas for international cooperation*
- *Promotion and contribution to standardisation activities*
- *Organisation of joint events contributing to the above outcomes*
- *Promotion of mobility of researchers in specific topics*
- *Analysis of modalities for cooperation*

HORIZON-CL4-2022-DIGITAL-EMERGING-01-38:

International cooperation in semiconductors (CSA)

Type of instrument: Coordination and Support Action (CSA)

Budget: 3 M€

Intended call key dates: *21st December 2021 (call opening)*

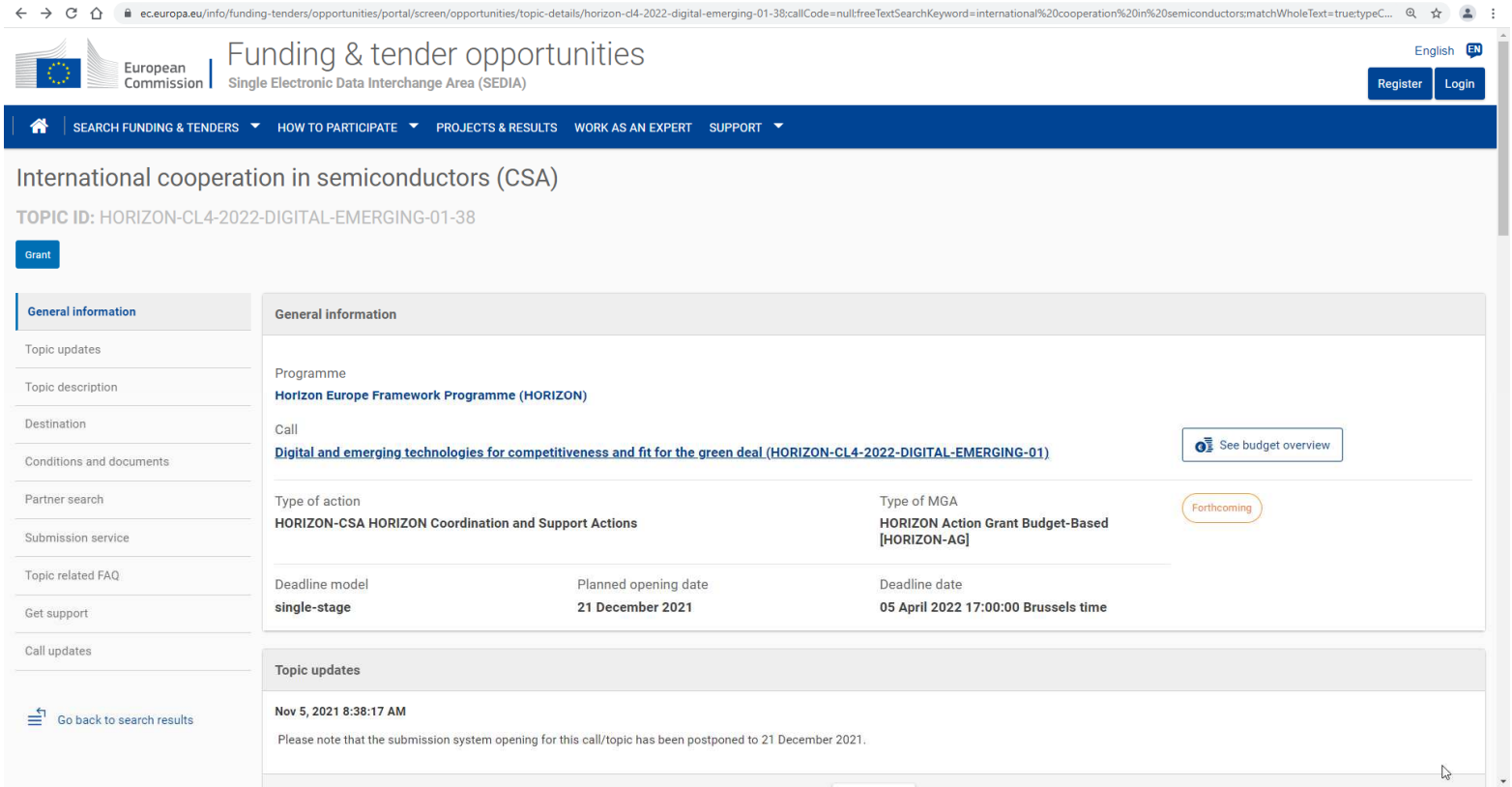
5th April 2022 @ 5pm (call closing)

Proposal expected duration: 3 years

Proposal expected funding: 3 M€

European Commission
Funding and Tender opportunities

Information to participants at
https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-search



Practical considerations

Summary

The CSA aims at supporting EU 'open strategic autonomy' policies in semiconductors. In particular, the cooperation with trusted countries for mutual benefit

One single action is expected addressing the full scope with a consortium that brings together the necessary competences:

- **a good understanding of the technologies, value chains and market dynamics of the sector**
- **awareness of public policies in relevant regions and on-going international initiatives**
- **familiar with R&I international cooperation and its implementation**

Proposers should be aware of initiatives in Member States on international cooperation and ensure that the CSA work complements and reinforces them

The presence in the consortium of partners with research background in semiconductors is important as research cooperation actions are expected to derive from the CSA

Involvement of international organisations from relevant countries is welcome

HORIZON-CL4-2022-DIGITAL-EMERGING-01-05/06/07

OUTLINE

CALL:
Opening June 22
Closing November 22

DESTINATION 4
DIGITAL AND EMERGING TECHNOLOGIES
FOR COMPETITIVENESS AND FIT FOR THE GREEN DEAL

Innovation in AI, Data and Robotics
DIGITAL-EMERGING-01-06:
AI, Data and Robotics for Industry optimisation (Production & Services) **(IA)**

Tomorrow's deployable Robots: efficient, robust, safe, adaptive and trusted
DIGITAL-EMERGING-01-06:
Pushing the limit of physical intelligence and performance **(RIA)**
DIGITAL-EMERGING-01-07:
Increased robotics capabilities demonstrated in key sectors **(IA)**

European Commission

INNOVATION IN AI, DATA AND ROBOTICS

HORIZON-CL4-2022-DIGITAL-EMERGING-01-05

- AI, DATA AND ROBOTICS FOR INDUSTRY OPTIMISATION (INCLUDING PRODUCTION AND SERVICES)

European Commission

TYPE: Innovation Action (IA)

SIZE:

Small Focused projects: no FSTP

Large projects: Min. 40% FSTP*

TRL start: 3-5 ➔ TRL end: 6-7

* FSTP: Financial Support to Third Parties

European Commission

AI, DATA AND ROBOTICS FOR FOR INDUSTRY OPTIMIZATION (PRODUCTION AND SERVICES)

EXPECTED OUTCOMES:

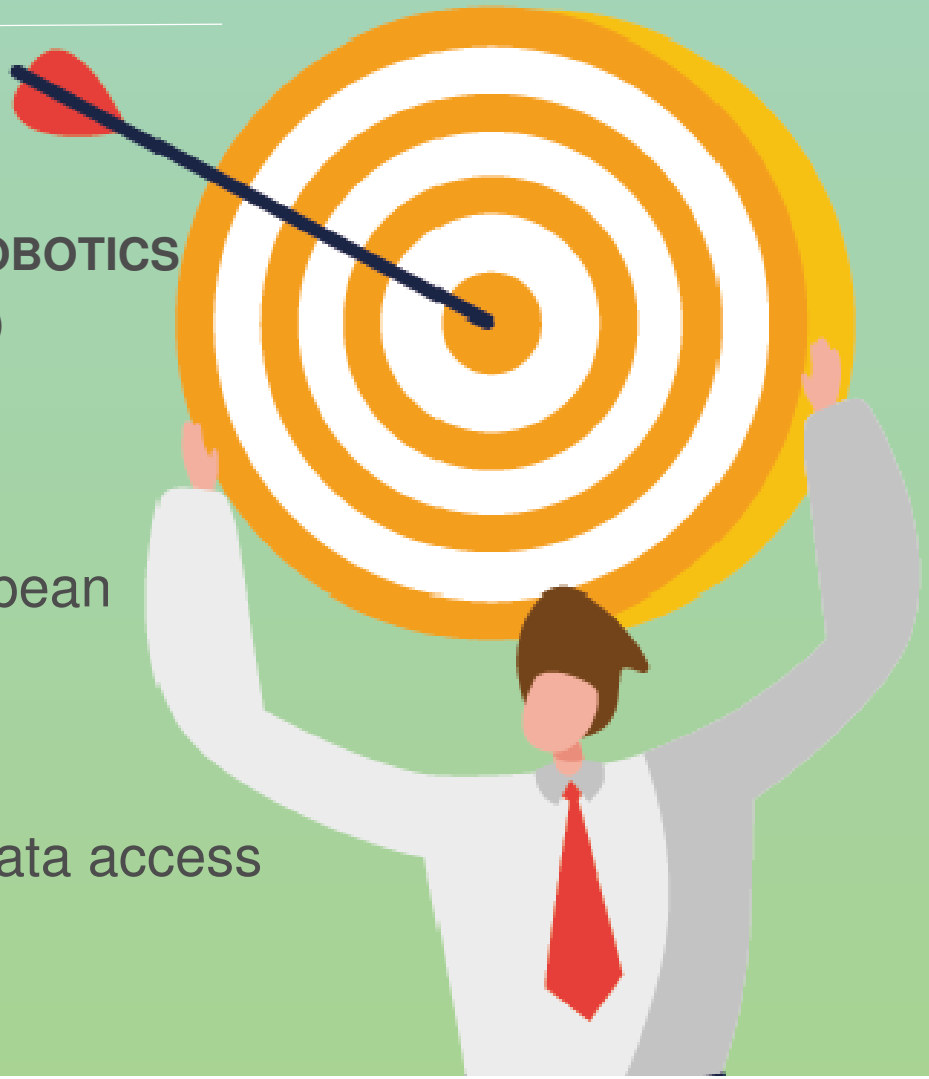
1. Advancing AI, DATA **AND** ROBOTICS, and automation for the **optimisation of production and services value-chains**
   - ➔ products, services, processes
   - ➔ competitiveness, working conditions, and envir. sustainability
2. AI FOR ADAPTING PRODUCTION OR SERVICES WORKFLOWS to
   - ➔changing environments, dynamic and unpredictable resource constraints and to the capabilities and restrictions of humans and transferring results from one domain to another.

SPECIFY: FOCUS (Production or Services) !!

Will be used for funding selection

European Commission

SCOPE: INTEGRATE AND OPTIMISE AI, DATA AND ROBOTICS SOLUTIONS TO DEMONSTRATE HOW THEY CAN OPTIMISE PRODUCTION AND SERVICE USE CASES



USTRY-EMPOWERING AI, DATA AND ROBOTICS

Use-cases driven (major industrial sectors)

Demonstrate:

- Technology performance
- Trustworthy solutions
- Substantial benefit to major European Industries

Deep involvement of stakeholders

Address also non-technical issues:

- ethical, trust, business support, data access and re-use

TWO TYPES OF PROPOSALS:

FOCUSED PROJECTS

Small

- user industry
- technology providers

LARGER PROJECTS

Challenges from User companies

Must include FSTP:

- >40% of the budget
- up to 200K€/TP
- TP = SMEs (70% funding) and start-ups (100% funding)

European Commission

Other requirements:

Build on existing results / Resources

Connect with stakeholders, DIH

+ PPP

User industries:

- requirements
- validation

Support to SMEs and Start-ups

&

Awareness Raising

European Commission

1. **What are you looking for?**

- Maximise impact (Major industrial sector + demonstrate clear benefits)
- Integrate and optimise AI, data and robotics solutions to demonstrate how they can contribute to the Use-Case
- Test in actual / highly realistic operating environments ➔ boost deployment
- Right mix of expertise
- BOTH Robotics and non-Robotics AI encouraged – ideal: combination AI-Data-Robotics
- BOTH Small (focused) and Large (FSTP) projects ➔ encourage GOOD FSTP as well

2. **What do you <u>NOT</u> want?**

- Major Research component ➔ BUT build on latest developments
- Tech push / Invented problems
- Niche sectors with limited impact
- Anything artificial ➔ BUT everything optimized towards the project objectives

TOMORROW'S DEPLOYABLE ROBOTS:

EFFICIENT, ROBUST, SAFE, ADAPTIVE AND TRUSTED

DIGITAL-EMERGING-01-06

- PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE (**RIA**)

DIGITAL-EMERGING-01-07

- INCREASED ROBOTICS CAPABILITIES DEMONSTRATED IN KEY SECTORS (**IA**)

European Commission

TOMORROW'S DEPLOYABLE ROBOTS:

EFFICIENT, ROBUST, SAFE, ADAPTIVE AND TRUSTED

DIGITAL-EMERGING-01-061

- PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE **(RIA)**

DIGITAL-EMERGING-01-07

- INCREASED ROBOTICS CAPABILITIES DEMONSTRATED IN KEY SECTORS **(IA)**

European Commission

PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE

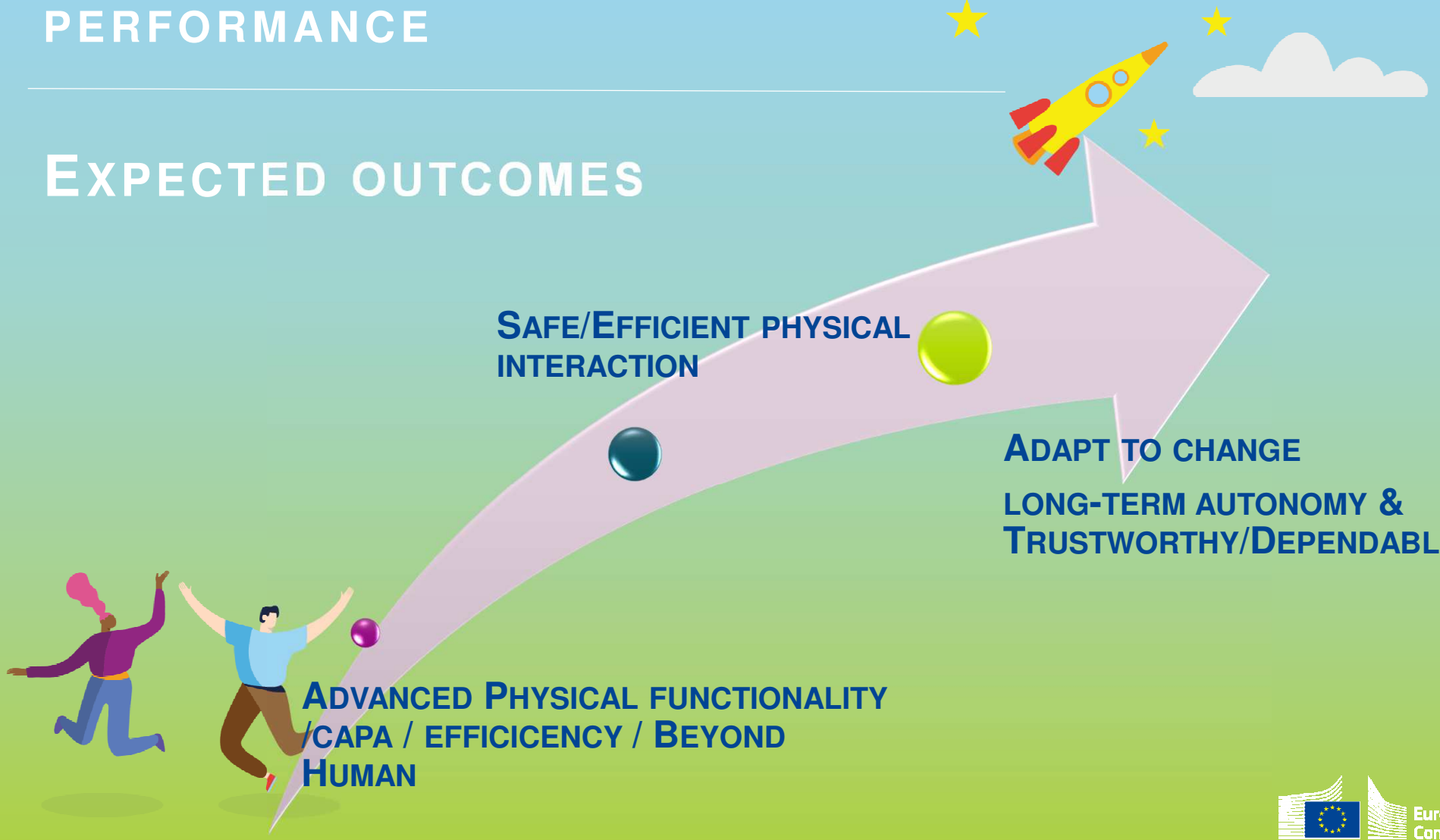
TYPE: Research and Innovation Action (RIA)

TRL start: 2-3 ➔ TRL end: 4-5

European Commission

PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE

EXPECTED OUTCOMES



European Commission

SCOPE

PHYSICAL PERFORMANCE

ROBUSTNESS & RESILIENCE, ENERGY EFFICIENCY + SAFETY & AUTONOMY, SPEED, EXTREME PHYSICAL CONDITIONS

PROMISING/ INNOVATOVE CONCEPTS

COLLABORATIVE, MODULAR AND DISTRIBUTED, HYPER REDUNDANT, HIGHLY RECONFIGURABLE, SOFT OR MINIATURISED ROBOTICS

➔ ADAPTATION

➔ NOVEL CONFIGURATIONS AND CONCEPTS

European Commission

SCOPE: NOVEL SCIENTIFIC APPROACHES OR PUSH THE LIMIT OF EXISTING ONES

+ ROBOTS PHYSICAL CAPABILITIES RELEVANT TO INDUSTRY AND SERVICE NEEDS

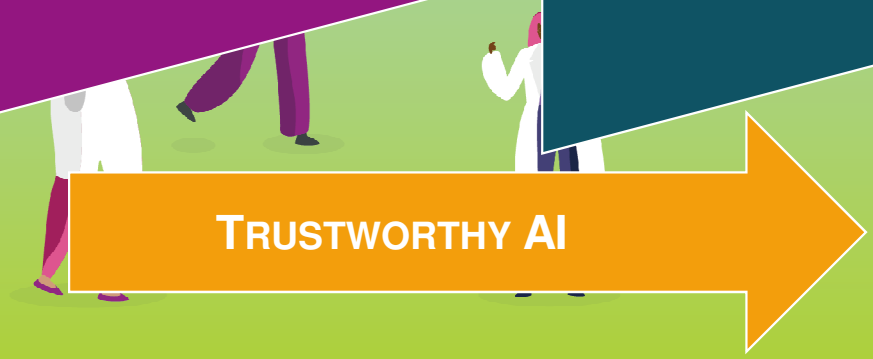
- ACTUATION, MINIATURIZATION, CONTROL, TRUSTWORTHINESS, DEPENDABILITY

+ PERFORMANCE AND INTERACTION OF ROBOTS IN REAL WORLD TASKS

- WHERE TESTABILITY IS LIMITED

RETHINK ROBOT BODIES

- + PHYSICAL AND INTERACTION CAPABILITIES
- ANY SIZE/TYPE OF ACTIVITY/ENVIRONMENT
- BUILD ON UNDERLYING TECHNOLOGIES, ENERGY EFFICIENCY, COGNITIVE MECHATRONICS..



TRUSTWORTHY AI

European Commission

ALL PROPOSALS EXPECTED TO

DEMONSTRATE PROGRESS

QUALITATIVE AND QUANTITATIVE KPIs

DEMONSTRATORS BENCHMARKING & PROGRESS MONITORING

European Commission

TOMORROW'S DEPLOYABLE ROBOTS:

EFFICIENT, ROBUST, SAFE, ADAPTIVE AND TRUSTED

DIGITAL-EMERGING-01-06

- PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE **(RIA)**

DIGITAL-EMERGING-01-07

- INCREASED ROBOTICS CAPABILITIES DEMONSTRATED IN KEY SECTORS **(IA)**

European Commission

INCREASED ROBOTICS CAPABILITIES DEMONSTRATED IN KEY SECTORS

TYPE: Innovation Action (IA)

BUDGET: FSTP*

at least 20% /200k€ per TP = Technology provider

TRL start: 3-5 ➔ TRL end: 6-7

* FSTP: Financial Support to Third Parties

European Commission

EXPECTED OUTCOMES CONTRIBUTE AT LEAST

ADDED VALUE OF ROBOTICS + THEIR PERFORMANCES

- MAJOR APPLICATION SECTORS
- DDD + STRENUOUS
- EXTREME ENVIRONMENTS

BEYOND HUMAN PERFORMANCE

- HIGH IMPACT IN KEY SECTORS
- ADAPTATION & FLEXIBILITY

REACTIVITY & RESPONSIVENESS & INTELLIGIBILITY

- INTERACTION
- MAJOR APPLICATION SECTORS

European Commission

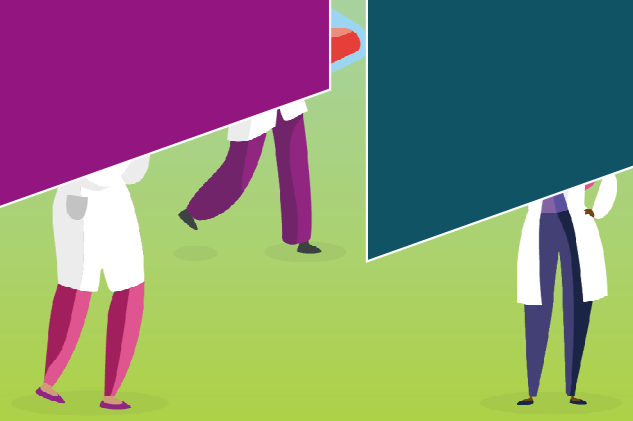
SCOPE:

SSH:
INTERACTION ACCEPTANCE

END-USERS /APPLICATION DRIVEN

HIGHLY REALISTIC ENVIRONMENT / REAL-WORLD SCENARIOS

DEMONSTRATE ADDED VALUE OF ROBOTICS – SUBSTANTIAL IMPACT – SHORT TERM BENEFIT



European Commission

SCOPE:

HUMAN-CENTERED

- INTERDISCIPLINARY: TECHNICAL + SSH
- INVOLVE WORKERS, PROFESSIONALS, ETC.
- TRUSTWORTHY AI

IF SHARED WORKSPACE

- SAFE, DEPENDABLE EFFICIENT AND INTUITIVE INTERACTION

CONFIGURATION AND DEPLOYMENT TOOLS ENCOURAGED

- FAST DEPLOYABILITY
- EASY RECONFIGURATION

European Commission

SCOPE: HIGH IMPACT SECTORS / USE-CASES WHERE THE TECHNOLOGY CAN DEMONSTRATE MAXIMUM ADDED VALUE

FOCUS ON **ONE USE-CASE:**

HIGH IMPACT

- MAJOR SECTOR WITH HIGH SOCIO-ECO / ENVIR. IMPACT

+ WORKING CONDITIONS

- KEEPING WORKERS AWAY FROM UNSAFE AND UNHEALTHY JOBS.

European Commission

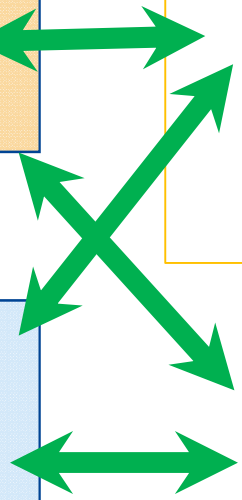
Work Programme topic: What are you looking for?

DIGITAL-EMERGING-01-061

- PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE **(RIA)**

DIGITAL-EMERGING-01-07

- INCREASED ROBOTICS CAPABILITIES DEMONSTRATED IN KEY SECTORS **(IA)**



AMBITIOUS: **Step change**

- (RIA) Physical Capability
- (IA) **High Impact** sectors/Use-Cases

Major benefit from Robotics

➔ HIGH VISIBILITY

Mutlidisciplinarity:

Dictated by the projects needs (tech development vs. use)

2. What do you NOT want?

DIGITAL-EMERGING-01-061

- PUSHING THE LIMIT OF PHYSICAL INTELLIGENCE AND PERFORMANCE **(RIA)**

DIGITAL-EMERGING-01-07

- INCREASED ROBOTICS CAPABILITIES DEMONSTRATED IN KEY SECTORS **(IA)**

INCREMENTAL PROGRESS

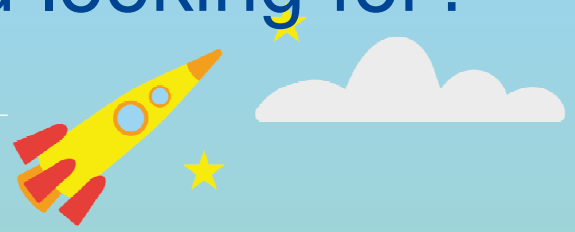
APPLICATIONS OF LIMITED IMPACT

INVENTED/TECH PUSH PROBLEMS/VALIDATION SCENARIOS

« ARTIFICIAL MULTIDICIPLINARITY »

➔ NOT DRIVEN BY PROJECTS OBJECTIVES

Work Programme topic: What are you looking for?



FOR ALL TOPICS PRESENTED

PROJECT REQUESTED TO

➔ DEDICATE A TASK TO CONNECT TO THE CSA – PPP ON AI, DATA AND ROBOTICS

➔BUILD ON/RE-USE RESULTS FROM PREVIOUS FUNDED ACTIONS

➔CONNECT TO DIHS

➔BUILD ON AI-ON-DEMAND PLATFORM (+ OTHERS)

➔ PUT THEIR COMMUNICABLE RESULTS ON THE AI-ON-DEMAND PLATFORM (+ OTHERS)

European Commission

Work Programme topic – topic evolution

3. Is this new or has it been called before?

e.g. *How is it new / different from previous calls*
What previous WP topic is it linked to?
What are the main changes?
Is it linked to other topics in the current WP? (e.g. in Pillar 2 or other pillars)

New:

- New: Bring AI, data and robotics together (2nd call in Horizon Europe)
- Build on Robotics/Big Data/AI from H2020
- Linked to the PPP related activities (CSA call on PPP/community building)
  ➔ connect to it

Work Programme topic – topic evolution

4. Current project portfolio *(if relevant)*

e.g. Please mention some highly relevant projects! Is there an overview of current project portfolio? Are there clusters / groups of projects?

PROJECTS FUNDED UNDER H2020 IN ROBOTICS/BIG DATA/AI (NON EXHAUSTIVE LIST BELOW)

ANNUAL BROCHURE OF ROBOTICS PROJECTS:

https://digital-strategy.ec.europa.eu/en/library/horizon-2020-new-robotics-projects-2021

https://digital-strategy.ec.europa.eu/en/events/discover-new-h2020-robotics-projects-contributing-sparc-strategy

https://digital-strategy.ec.europa.eu/en/events/new-h2020-robotics-projects-sparc-strategy

https://www.eu-robotics.net/sparc/projects/robotics-projects-funded-by-horizon2020.html?changelang=2

DIHS IN ROBOTICS: https://ri4eu.eu/

BDVA projects: https://www.bdva.eu/ppp-projects

AI-ON DEMAND PLATFORM (ICT26 + ICT49): https://www.ai4europe.eu/

CHECK IN MARCH 2021 - CALL1 RESULTS: AI, DATA & ROBOTICS FOR THE GREEN DEAL / AT WORK + NETWORK OF EXCELLENCE IN ROBOTICS + ROBOTICS COGNITION

DESTINATION 6: AI (RIAS) + CSA + AI-ON-DEMAND PLATFORM (SERVING THE RESEARCH COMMUNITY).

Work Programme topic – Key actors

5. Who are the types of main stakeholders that are addressed?

- Technology developers – AI, Data, Robotics
- User industry (production & services / High impact sector for Robotics Innovation)
- Specifics (User industry + non-tech: SSH, workers, innovation support, etc)

➔multidisciplinary

6. Is there a key group of actors (eg. Partnership or other) driving this?

PPP on A, Data and Robotics - https://ai-data-robotics-partnership.eu/

e.g. Relevant Partnership(s), technology platform(s), other groups …

Work Programme topic

7. Are there any additional / background documents?

e.g. *call specific background / guidance notes;*

EC communications and other policy documents;

strategic research agendas, other research roadmaps;

PPP: SRIDA (BACKGROUND) - https://ai-data-robotics-partnership.eu/

EUROPEAN AI STRATEGY: https://digital-strategy.ec.europa.eu/en/policies/european-approach-artificial-intelligence

Future Outlook

8. Do you have information about future trends, emerging initiatives, roadmaps, type of stakeholders in this area?

- New PPP just launched
- Coordinated plan on AI: https://digital-strategy.ec.europa.eu/en/library/coordinated-plan-artificial-intelligence-2021-review

Upcoming events / information days

9. Please list upcoming information days and other events of relevance to this area

Stay tuned:

- Launch event of the AI-Data-Robotics PPP – 25th November 2021
  ➔ Mobilise your stakeholders to join
- https://ai-data-robotics-partnership.eu/
  IN DUE COURSE (Call OPENS in JUNE 2022)