Destination 4 - Objective "European Innovation Leadership in Photonics"

European Commission

Call: HORIZON-CL4-2024-DIGITAL-EMERGING-01

European Innovation Leadership in Photonics

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-54: Smart photonics for joint communication & sensing and access everywhere (Photonics Partnership) (RIA)

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-55: Photonics Innovation Factory for Europe (Photonics Partnership) (IA)

European Commission

Smart photonics for joint communication & sensing and access everywhere
HORIZON-CL4-2024-DIGITAL-EMERGING-01-54

PROJECTS

- **RIA**
- EU contribution/project: **3-5 million Euro**
- Implementing the European **Partnership in Photonics**

BUDGET

- **18 million Euro**
- Call in **2024**

TRL (TECHNOLOGY READINESS LEVEL)

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

European Commission

HORIZON-CL4-2024-DIGITAL-EMERGING-01-54: Smart photonics for joint communication & sensing and access everywhere (Photonics Partnership) (RIA)

Expected Outcomes:

Contribution to:

- Sensors/probes to monitor the quality of the communication network and of photonic signals transported in the communication network

- Methods to use the network as large-scale distributed sensor

- Development of foundational optical technologies, systems and networks that provide the future access infrastructure

European Commission

HORIZON-CL4-2024-DIGITAL-EMERGING-01-54: (cont')
Smart photonics for joint communication & sensing and access everywhere

Scope

Address at least one of the two:

• **Light-based solutions to let the communication network sense, while transporting data, <u>for example</u>**

- To enhance the security and resilience of the network

- To make network resources more energy efficient

- To warn and protect against natural disasters, earthquakes etc.

- To monitor the infrastructure where the fibre is deployed (traffic, stress in bridges…)

• **Light-based solutions to bring internet everywhere, with the most relevant access technologies**

- Fiber to the home, fiber to the antenna or fiber to the sky (satellite), for example with coherent passive optical networks, free space optics, Lifi or optical beamforming and steering

- while enabling the integration of all access technologies in one system

European Commission

Photonics Innovation Factory for Europe
HORIZON-CL4-2024-DIGITAL-EMERGING-01-55

PROJECTS

- **IA**
- EU contribution/project: **up to 15 million Euro**
- Implementing the European Partnership in **Photonics**

BUDGET

- **15 million Euro**
- Call in **2024**

TRL (TECHNOLOGY READINESS LEVEL)

- **From 2-5 to 4-7** by the end of the project

European Commission

Expected Outcome   CL4-DigEm-01-55 **Photonics Innovation Factory**

- Substantially improved penetration of core photonics technologies into multiple end-user application domains and industry sectors

- Substantial contribution to the creation of a sustainable streamlined ecosystem for photonics innovation in Europe from TRL 2-7, providing European Cross-Border Added Value with a high leveraging effect on investments made at national and regional level in photonics.

European Commission

Scope 1   CL4-DigEm-01-55 **Photonics Innovation Factory**

- **Provide a virtual innovation platform with a flexible and open structure**
    - allowing for a multiplicity of competitive actors and services
    - operating as a sustainable fully integrated European ecosystem
    - lowering the entry threshold to the use of photonics
    - facilitating its broad uptake and integration in new products and processes

European Commission

Scope 2

CL4-DigEm-01-55 **Photonics Innovation Factory**

- **Platform should offer a streamlined virtual access to a supply chain of photonic technologies**

- **Support through a network of competence centers acting as a single consortium**

- **Platform should target primarily first users and early adopters**

- **Create innovation pathways from initial concept through to production**

- **Support cases should be innovative and industrially relevant.**

  - Depending on the specific need they may start at TRLs from 2 to 5

  - They should increase the TRL by at least two levels

European
Commission

Scope 3

- **The action should provide strong linkages with established European industry and investment networks in the photonics area.**

- **The action should address innovation-readiness support in the form of Demonstration Centers and Experience Centers**

  - to help prepare business cases

  - to offer additional supports such as technology, business, investment, and intellectual property coaching

- **The action should develop plans to sustain its activities beyond the end of the project.**

European Commission

Destination 4 - Objective "AI, Data and Robotics"

European Commission

Call: HORIZON-CL4-2024-DIGITAL-EMERGING-01

AI, Data and Robotics

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-03: Novel paradigms andapproaches, towards AI-powered robots– step change in functionality (AI, data androbotics partnership) (RIA)

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-04 Industrial leadership in AI, Dataand Robotics boosting competitiveness and the green transition (AI Data and RoboticsPartnership)(IA)

European Commission

HORIZON-CL4-2024-DIGITAL-EMERGING-01-03: Novel paradigms and approaches, towards AI-powered robots– step change in functionality (AI, data and robotics partnership) (RIA)

Expected Outcome: projects are expected to contribute to ALL of the following primary outcomes

- Achieve the substantial next step in the **ability of robots to perform non-repetitive functional tasks in realistic settings**, based on underlying robot functions (e.g. guidance/navigation/manipulation/interaction etc.), demonstrated in key high impact sectors where robotics has the potential to deliver significant economic and/or societal benefits.

- Step change in the enabling conditions essential for the **accelerated diffusion of robots in various industries, sectors and services** which can 1) handle tasks efficiently, robustly, and safely and 2) interact naturally and smoothly to support humans in their daily activities, based on a strong multidisciplinary approach, including the relevant SSH dimension.

- The development, use and exploitation of major **advances in science and technology** for the enhancement of European robotics, in order to maintain Europe's scientific excellence and ensure sovereignty of key technologies relevant to robotics

- Create opportunities to affect society in the longer term by **contributing to impact on major broad societal challenges**.

Indicative budget: 30 million EUR
EU contribution per project: 8 million EUR
Type of Action: RIA

TRL: start at TRL 2-3 and achieve TRL 4-5

HORIZON-CL4-2024-DIGITAL-EMERGING-01-04: Industrial leadership in AI, Data and Robotics boosting competitiveness and the green transition (AI Data and Robotics Partnership) (IA)

Expected Outcome: projects are expected to contribute to only ONE of the two following outcomes

Systems to address large scale challenges with significant impact on the objectives of the green deal

- using combined robotics, data and AI solutions (e.g. improving energy consumption, cleaning up contaminated land and waterways, recycling, accelerating circular economy…)

- using combined AI and data solutions (e.g. resource optimisation, maximizing energy efficiency, minimizing waste, recycling…)

Scope: multidisciplinary innovation activities should address ONE of the following

- Large scale-pilots bringing major industries from key application sectors in Europe with the goal of exploiting and integrating existing tools, sub-systems and solutions that are re-usable from other sectors. No financial support to third parties (FSTP).

- Development of large-scale pilots addressing key applications on the green deal. FSTP (40% of the budget) should be used to allow third parties (usually small companies) using pilots for developing, testing and validating innovative solutions

Indicative budget: 60 million EUR
EU contribution per project: 10 million EUR (may include FSTP in the form of grants)
Type of Action: IA

TRL: start at TRL 3-5 and achieve TRL 6-7

THE EU RESEARCH AND INNOVATION PROGRAMME (2021-27)

Destination 4 - Objective "Open Source for Cloud/Edge and Software Engineering Fundamentals to support Digital Autonomy"

LUIS C. BUSQUETS PÉREZ
PROGRAMME OFFICER

European Commission
DG CONNECT E2
Cloud and Software

Call: HORIZON-CL4-2024-DIGITAL-EMERGING-01

Open Source for Cloud/Edge and Software Engineering Fundamentals to support Digital Autonomy

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-22: Fundamentals of Software Engineering (RIA)
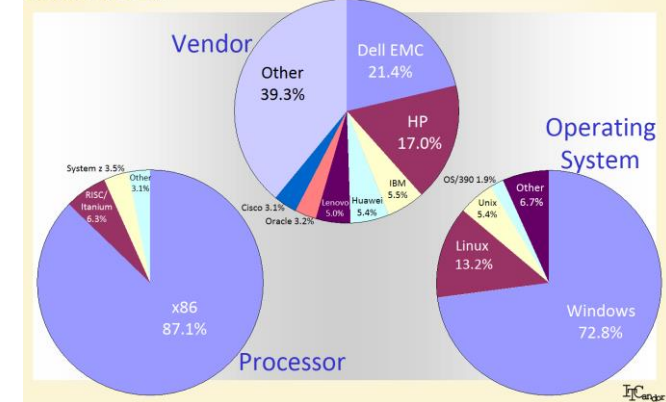
- HORIZON-CL4-2024-DIGITAL-EMERGING-01-21: Open Source for Cloud/Edge to support European Digital Autonomy (RIA)

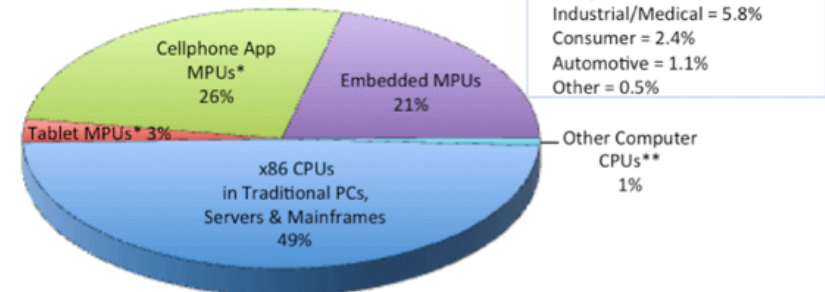- HORIZON-CL4-2024-DIGITAL-EMERGING-01-23: Public recognition scheme for Open Source (CSA)

European Commission

Market size and interest from the Computing Continuum perspective

	Prod. in Europe (€ B)	% Europe/World
Market service providers 43 691 B€	11 054	25%
Telecom operators, Internet, IT, Cloud, etc.		
Transportation, Health, Installation, Maintenance, Repair, etc.		
Industrial equip. Industry 1 497 B€ / Aero/Def/Secu Industry 1 457 B€ / Automotive Industry 1 457 B€	980	20%
Stand alone electronics PC, Telecoms, Audio & Video 992 B€ — Stand alone	60	6%
Embedded electronics Auto, Indus, Medical, Aero/Def/Sec 1 026 B€ — Embedded	229	22%
Total electronic equipment 2 018 B€	290	14%
Electronic boards 1 241 B€	126	10%
Semiconductors 456 B€ — SC	40	9%
Other elect. components 226 B€ — Other	15	7%
Materials & tools SC 105 B€ Other 36 B€	24	17%

Server market shares – year to end June 2019 – total: $81b

Vendor:
- Other 39.3%
- Dell EMC 21.4%
- HP 17.0%
- IBM 5.5%
- Huawei 5.4%
- Lenovo 5.0%
- Oracle 3.2%
- Cisco 3.1%

Processor:
- x86 87.1%
- RISC/Itanium 6.3%
- System z 3.5%
- Other 3.1%

Operating System:
- Windows 72.8%
- Linux 13.2%
- Other 6.7%
- Unix 5.4%
- OS/390 1.9%

2020 MPU Sales by Application (Fcst, $79.3B)

- Cellphone App MPUs* 26%
- Embedded MPUs 21%
- Tablet MPUs* 3%
- x86 CPUs in Traditional PCs, Servers & Mainframes 49%
- Other Computer CPUs** 1%

Embedded Microprocessors = 21%
- Communications = 9.4%
- Computers & Peripherals = 1.9%
- Industrial/Medical = 5.8%
- Consumer = 2.4%
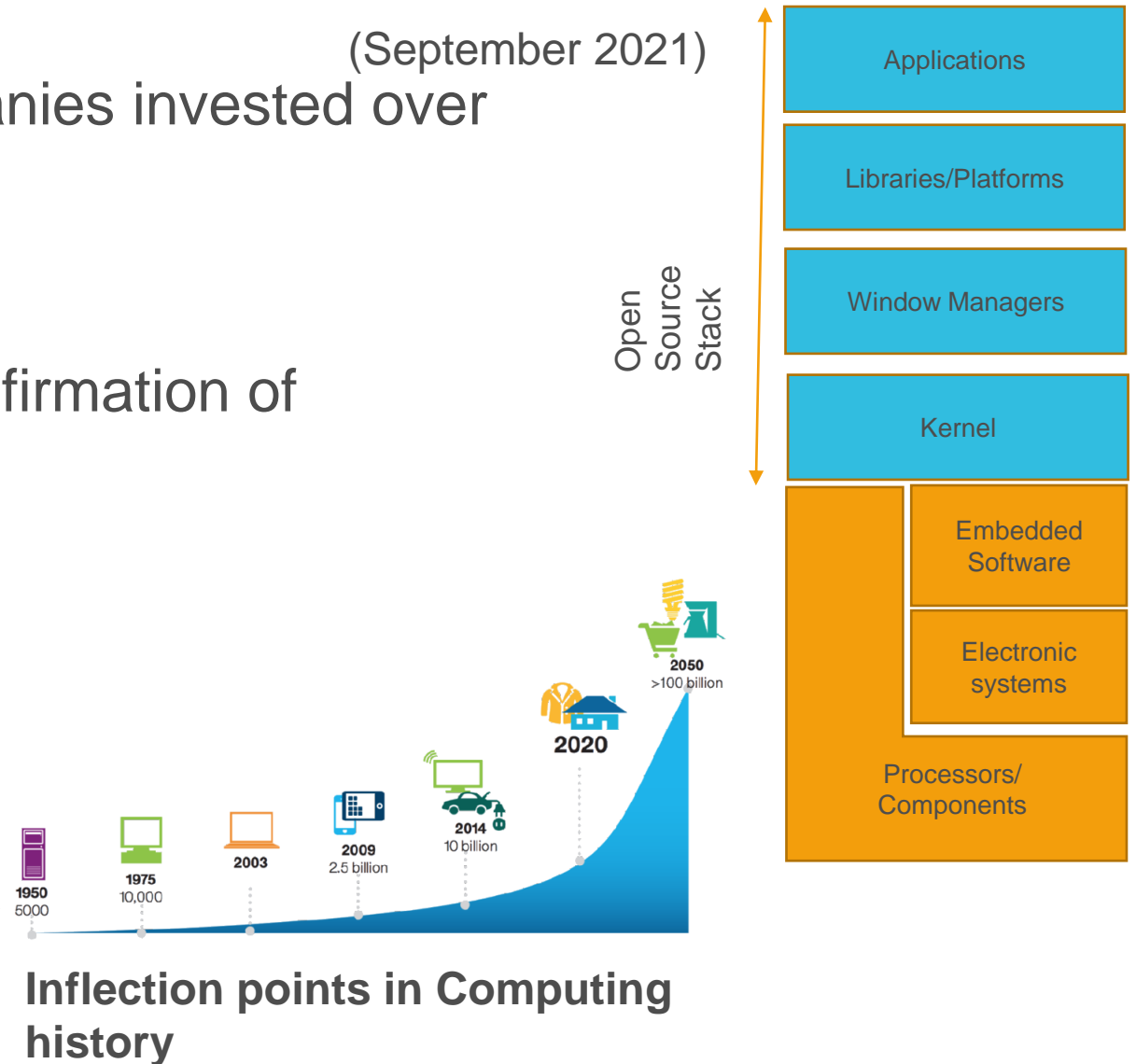- Automotive = 1.1%
- Other = 0.5%

*Includes ARM-based and x86 processors. **Includes ARM-based and other RISC processors.
Source: IC Insights

European Commission

Study on the Economic Impact of Open Source in the EU economy

(September 2021)

- Confirmation of big impact: EU companies invested over €1b in OSS
- Cost Benefit ratio above 1:4
- Impact between €65 and €95b
- Positive correlation with GDP and confirmation of causality
- Open Source → Public good
- EU policies required.
- Case studies confirm TCO reduction, avoid vendor lock-in and increase digital autonomy.

→ Digital Autonomy

Inflection points in Computing history

Open Source Stack

| Applications |
| Libraries/Platforms |
| Window Managers |
| Kernel |
| Embedded Software |
| Electronic systems |
| Processors/ Components |

1950 5000
1975 10,000
2003
2009 2.5 billion
2014 10 billion
2020
2050 >100 billion

HORIZON-CL4-2024-DIGITAL-EMERGING-01-21: Open Source for Cloud/Edge to support European Digital Autonomy (RIA)

Expected Outcomes:

- Prototypes of cloud and edge servers demonstrated in relevant centralised and distributed environments and allowing full computing infrastructure deployments based on European processor technology, thereby establishing a full Open Computing Architecture stack, which supports emerging processing architectures (e.g. RISC-V).

- Standards and best practices consolidating the European Open Computing Architecture, as well as its interfaces to current industry standards.

Scope:

- Developing open source alternatives to enable the physical use of emerging processors in cloud and edge server systems. Such modules include basic input/output systems, preboot execution environments, power-on authentication, etc., supporting heterogeneous processor architectures, and

- Demonstrating actual cloud and edge systems in real life or emulated computing environments exploiting the benefits of an extended open source stack (socket to application) on emerging processor architectures (e.g. RISC-V).
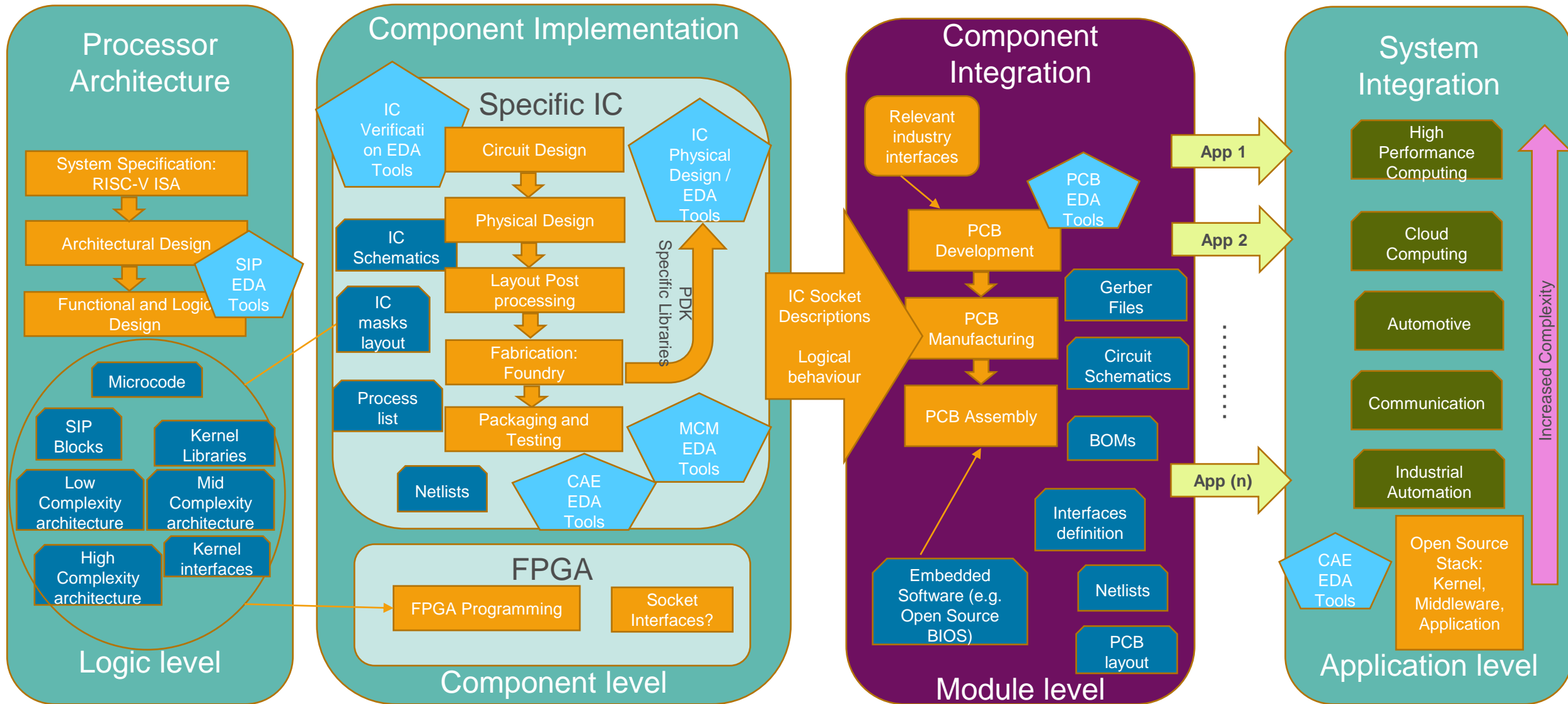
Indicative budget: **20 000 000 EUR**
EU contribution per project: 4-6 MM EUR
Type of Action: RIA

TRL: **From 4 to 6**

RISC-V Development foci from Architecture to Application

Processor Architecture

System Specification: RISC-V ISA

Architectural Design

Functional and Logic Design

SIP EDA Tools

Microcode

SIP Blocks

Kernel Libraries

Low Complexity architecture

Mid Complexity architecture

High Complexity architecture

Kernel interfaces

Logic level

Component Implementation

Specific IC

IC Verification EDA Tools

Circuit Design

Physical Design

Layout Post processing

Fabrication: Foundry

Packaging and Testing

IC Physical Design / EDA Tools

IC Schematics

IC masks layout

Process list

Netlists

PDK Specific Libraries

MCM EDA Tools

CAE EDA Tools

FPGA

FPGA Programming

Socket Interfaces?

Component level

IC Socket Descriptions

Logical behaviour

Component Integration

Relevant industry interfaces

PCB EDA Tools

PCB Development

PCB Manufacturing

PCB Assembly

Gerber Files

Circuit Schematics

BOMs

Interfaces definition

Embedded Software (e.g. Open Source BIOS)

Netlists

PCB layout

Module level

App 1

App 2

App (n)

System Integration

High Performance Computing

Cloud Computing

Automotive

Communication

Industrial Automation

CAE EDA Tools

Open Source Stack: Kernel, Middleware, Application

Increased Complexity

Application level

HORIZON-CL4-2024-DIGITAL-EMERGING-01-22: Fundamentals of Software Engineering (RIA)

Expected Outcomes:

- Responsible software engineering methods and tools

- Best practices leveraging, among others, novel AI and data technologies to accelerate the development and maintenance of software

- Methods and tools for multi-architecture systems

- Efficient and agile modelling, verification and validation, vulnerability assessment and mitigation.

Scope:

- Methods, mechanisms and tools that allow smart intelligent system specification, agile system and code development, advanced code analysis, fault prediction and location and self-repair by using emerging techniques, in particular based on AI and data technologies.

- Methods and tools for the development of dynamic and resilient software for systems running on multiple processing architectures including cross-compilation, run-time self adaptation and multi-architecture executables.

Indicative budget: **18 000 000 EUR**
EU contribution per project: **3-5 MM EUR**
Type of Action: **RIA**

TRL: **From 2 to 5**

HORIZON-CL4-2024-DIGITAL-EMERGING-01-23: Public recognition scheme for Open Source (CSA)

Expected Outcomes:

- Establishment of a system of European annual awards that acts as a spotlight stirring up contributions to Open Source Software and Hardware projects.

- Increased interest for the contribution to, integration of and exploitation of Open Source assets

Scope:

- Development of a scheme including a list of fields related to Open Source

- Ellaboration of an adequate process to:

    - scrutinize different fields of action relevant to open source

    - select appropriate candidates for being recognized

    - implement adequate award ceremonies.

Indicative budget: **2 000 000 EUR**
EU contribution per project: **2 000 000 EUR**
Type of Action: **CSA**
TRL: **N/A**

European Commission

Call: HORIZON-CL4-2024-DIGITAL-EMERGING-01

Flagship on Quantum Technologies: a Paradigm Shift

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-42: Stimulating transnational research and development of next generation quantum technologies, including basic theories and components (Cascading grant with FSTP)

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-45: Quantum sensing and metrology for market uptake (IA)

European Commission

HORIZON-CL4-2024-DIGITAL-EMERGING-01-42: Stimulating transnational research and development of next generation quantum technologies, including basic theories and components (Cascading grant with FSTP)

Expected Outcomes:

- Support to transnational projects in quantum technologies, fostering synergy between European, national and regional initiatives and promoting broader partnerships between the EU stakeholders.

- Achieve closer coordination and greater mobilisation and pooling of resources.

- Support the Quantum Flagship by implementing calls for proposals resulting in grants to third parties.

Indicative budget: EUR 15.00 million
EU contribution per project: EUR 15.00 million
Type of Action: RIA, Cascading grant with FSTP (can only be provided in the form of grants)

- **The maximum amount to be granted to each third party is EUR 700.000**

- **Minimum 85% of EU funding to be allocated to FSTP, selected through joint calls**

- **Third parties will be funded through projects of around EUR 2.5 million per project**

TRL: Start at TRL 1-4 and achieve TRL up to 6

Eligibility conditions: MS, associated countries, OECD and Mercosur countries

Call Opening: Around April 2024

DISCLAIMER: This topic will be cancelled but will be reinserted in a new 2024 HUMAN Call to be added in the upcoming amendment of the Work Programme. This amendment has not been adopted by the European Commission yet. Only the adopted work programme will have legal value. The adoption of the amended WP will be announced on the F&T Portal.

European Commission

HORIZON-CL4-2024-DIGITAL-EMERGING-01-45: Quantum sensing and metrology for market uptake (IA)

Expected Outcomes:

- Contribute to **mature quantum sensing technologies and devices**

- In a **broad range of application sectors**

- Goal to **establish a reliable, efficient supply chain** – first standardisation and calibration efforts

→ Demonstrate **advanced prototypes** with unprecedented level of precision and stability

→ Target miniaturised, integrated, transportable sensors and plans for further **industrialisation**

→ Importance of targeted **collaborations**

Indicative budget:	**MEUR 15**
EU contribution per project:	**MEUR 4-5**
Type of Action:	**Innovation Action**
TRL:	**from TRL 4-5 to TRL 6-7**
Eligibility conditions:	Participation limited to: **MS, Iceland, Norway, Israel**
	Entities directly or indirectly controlled by a non-eligible country/country entity, may not participate (unless **guarantees** provided)

Destination 4 – Objective "Graphene and 2D materials: Europe in the lead"

Call: HORIZON-CL4-2024-DIGITAL-EMERGING-01

Graphene and 2D materials: Europe in the lead

- HORIZON-CL4-2024-DIGITAL-EMERGING-01-31: Pilot line(s) for 2D materials-based devices (RIA)

Context and objectives:

- Starting from and continuing the Graphene Flagship (GF)
- Build on the GF's achievements, pursue R&I activities and accelerate the technology developments
- Concrete innovation opportunities and production capabilities
- Strong supply and value chains in graphene and 2D materials in Europe

➢ First wave of topics in WP 2021-2022:
  ✓ RIAs and IA on electronics, energy, biomedical technologies, composites
  ✓ A CSA for governance and coordination of the GF initiative
➢ Second wave of topics in WP 2023-2024:
  ➢ 2023: RIAs on Sustainable and Safe by Design 2Dmaterials, and 2D materials of tomorrow

European Commission

HORIZON-CL4-2024-DIGITAL-EMERGING-01-31: Pilot line(s) for 2D materials-based devices (RIA)

Continuation of the 2D experimental Pilot Line, build on the IP developed therein

Expected Outcomes:

- Broadly accessible pilot line(s) fostering the creation of **electronic and photonic devices and systems (co-)integrating 2D materials**

- Significant progress towards the adoption of the 2D materials in the silicon and semi-conductor arena by allowing the production of new (co-)integrated devices and systems in a quality-controlled way

Indicative budget: EUR 33 million
EU contribution per project: EUR 33 million
Type of Action: RIA
TRL: Electronics: starting TRL 3 with ending TRL 5 / Photonics: starting TRL 3-4 and ending TRL 5-6

Proposals should:

➢ include a business case and exploitation strategy

➢ cover the contribution to the governance and overall coordination of the Graphene Flagship initiative

➢ develop synergies and relate to activities and outcomes of the projects selected under the other topics of

'Graphene and 2D materials: Europe in the lead' and where relevant of the KDT JU.

European Commission