

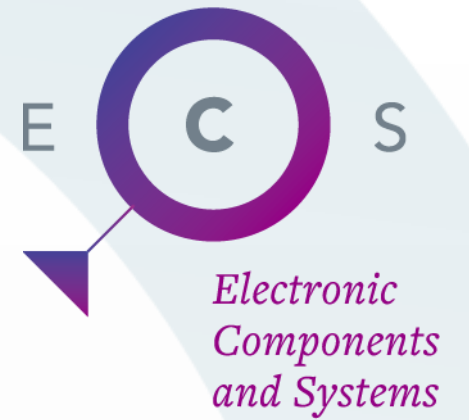
# ECS SRIA 2022

ECSEL/KDT Italy Day, May 31st, 2022

Patrick Cogez

ECS-SRIA Co-Chair, AENEAS Technical Director

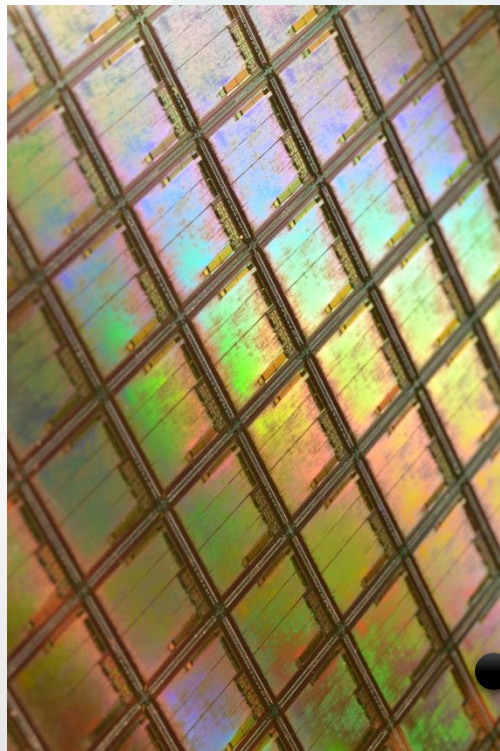
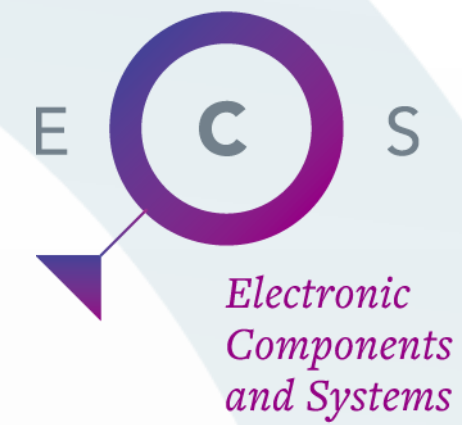
# The ECS-SRIA 2022 Basis for KDT Calls 2022



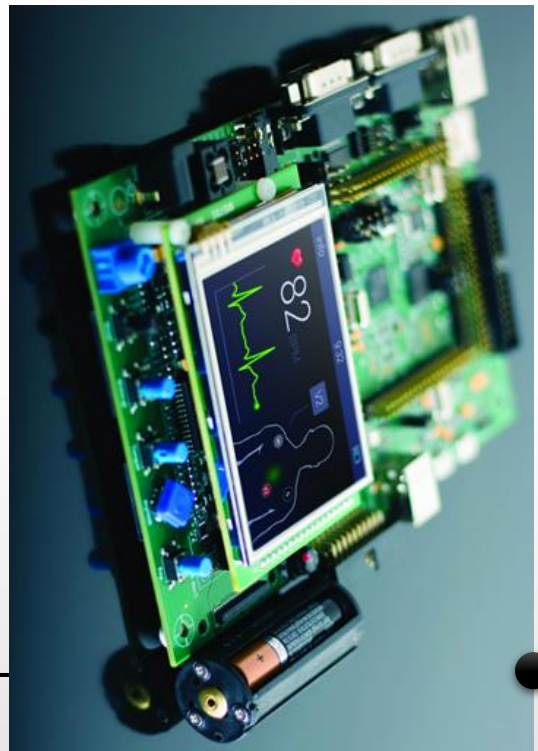
SHAPING



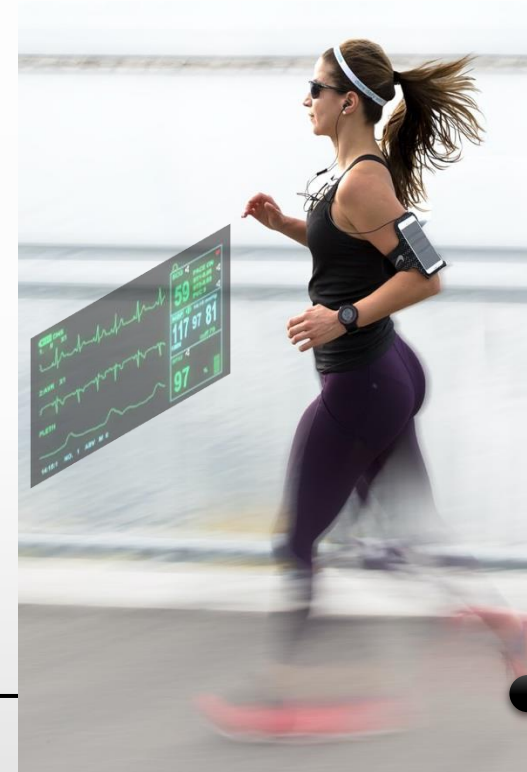
# The SRIA for the ECS value chain



Materials, processes, semiconductors, micro & nano electronic components, ...



Smart sensors, integrated devices, edge AI, embedded SW, ...



Systems and applications, value creation, societal goals, ...



ECS engineering tools



<https://ecscollaborationtool.eu/news-overview/news-ecs-sria-2022.html>

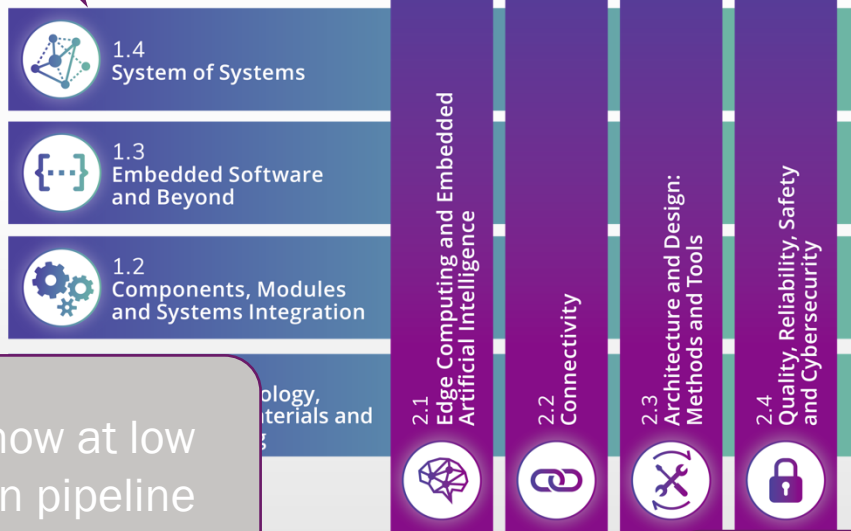
# ECS-SRIA structure



Basic technology stack of a typical digitalization solution

Key ECS application domains for Europe  
Enabled by and driving ECS technology roadmaps

## 1 FOUNDATIONAL TECHNOLOGY LAYERS



What needs to be addressed now at low TRL level to feed the innovation pipeline

## Transversal areas

- Benefiting from interdisciplinary contribution of the foundational layers
- Or supporting technology stack across all layers

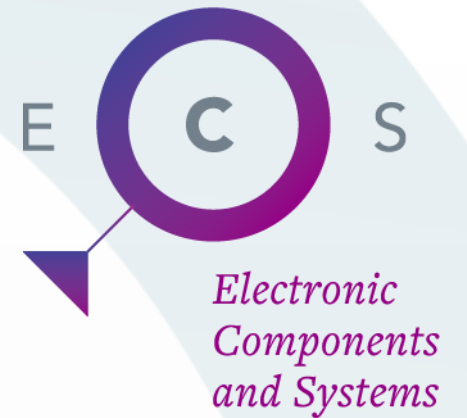
## ECS KEY APPLICATION AREAS

## 4 LONG TERM VISION



# 2022 Update

## What is new vs. 2021 Edition?



### Updating contents

- Improve the delineation of existing concepts and introduce new concepts
- Minimize unnecessary overlapping and avoid fragmentation

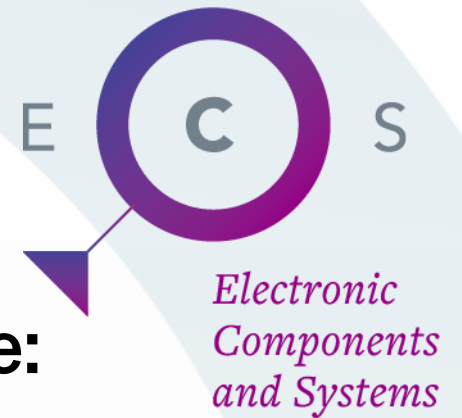
### Highlighting the ECS-SRIA interdependencies:

- **Synergies** between the chapters: Cross-references
- **Interdisciplinarity** between technology domains, and between technology and applications: Global outline

### Improving readability

- Keyword index

# ECS-SRIA 2022 content updates



**SRIA 2022 content updates cover the entire SRIA and include:**

- Feedback from the ECS community and the EU Commission on specific topics
- The input provided by the 6 thematic workshops
- Updates planned in 2020 or emerging in 2021

**Scope extension** to include quantum technologies, integrated photonics, flexible electronics and open-source hardware.

**New leaders** for some chapters.

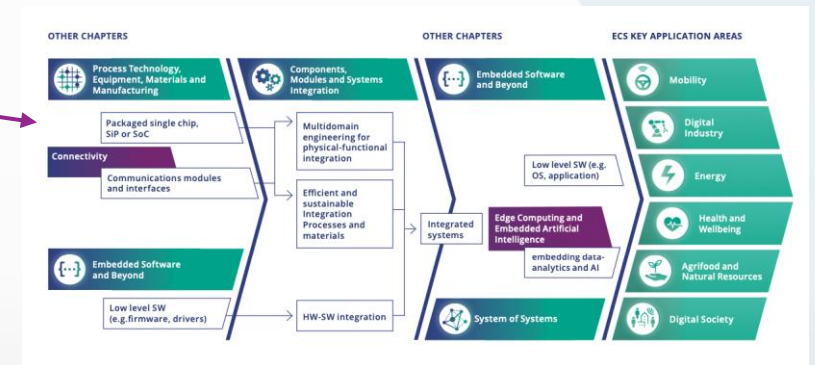
**New contributors** in almost all the chapters.

# ECS-SRIA 2022 content updates Details (1)



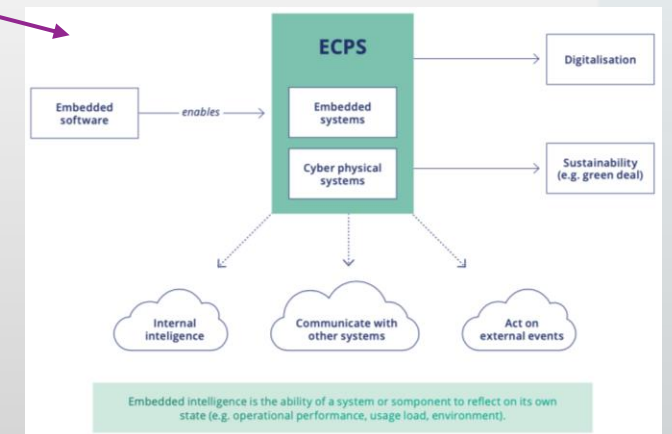
## Chapters 1.1 and 1.2 (- Process Technology, Equipment, Materials and Manufacturing): - Components, Modules and Systems Integration)

- Improved delineation of concepts and synergies between the Chapters
  - SoC to System-in-Package (SiP) represents the transition between 1.1 and 1.2
  - In chapter 1.2, a new chapter structure has been included
- Extended focus on heterogeneous integration of devices and components for physical and functional integration (PFI) (1.2)
  - Including support for flexible electronics and photonics solutions



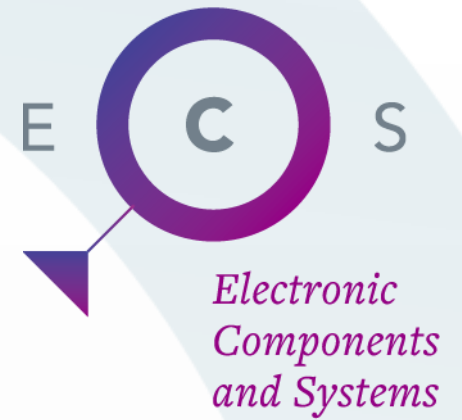
## Chapter 1.3 (Embedded Software and Beyond):

- Better delineation of the concept of Embedded and Cyber-physical System (ECPS).
- Stronger link with embedded intelligence (2.1)
- Trade off between HW resources and SW abstraction (Green Deal)
- More focus on:
  - Open-source software
  - Digital twin
  - SW features supporting SoS



# ECS-SRIA 2022 content updates

## Details (2)



### Chapter 1.4 (System of Systems):

- General restructuring and improvement of concepts delineation
- M.C. 1 and M.C. 5 (2021) merged in a new M.C. 1 - “SoS architecture and open integration platforms”
- “Advanced control” topic moved from Chapter 2.1 and created a new challenge M.C. 5 - “Major Challenge 5: control in SoS composed of embedded and cyber-physical systems”
- New M.C. 6 - “SoS monitoring and management”

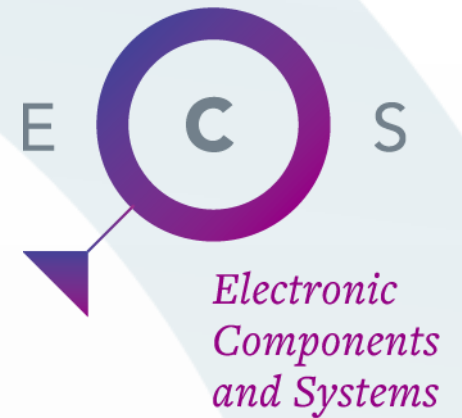
### Chapter 2.1 (Edge Computing and Embedded Artificial Intelligence):

- Complete restructuring and editing
  - Improved delineation of Edge Computing and Artificial Intelligence
  - And their **convergence towards the embedded intelligence on the edge - Edge AI**
  - Classification of edge computing levels included
  - Positioning of Embedded Artificial Intelligence
  - All 4 M.C. split between Edge Computing and Embedded Intelligence
- Broaden the scope of “advanced control” that has been moved in chapter 1.4 (SoS):
  - Edge AI remains linked to advanced control as an enabler



# ECS-SRIA 2022 content updates

## Details (3)



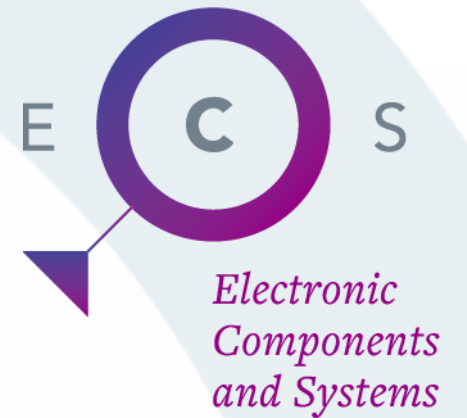
### Chapter 2.2 (Connectivity):

- Analysis of European HW production capability (6G focus)
- 6G focus: alignment with 6G EU Initiatives
- Expansion of connectivity from point-to-point to application-to-application:
  - To support SoS paradigm and network virtualization
  - New M.C. 5: network virtualization enabling run-time engineering, deployment and management of edge and cloud network architectures.

### Chapter 2.3 (Architecture and Design: Methods and Tools):

- Better delineation and extended focus on:
  - Support for Fog-Edge-Cloud continuum
  - Integration platforms
  - Full lifecycle support, including maintenance and End-of-Life / second life aspects (Green Deal)
  - Support for AI based components
  - Support for legacy components
  - Support for (SW-)updates

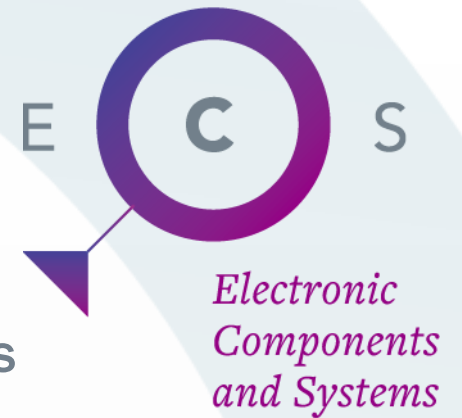
# ECS-SRIA 2022 content updates Details (4)



## Chapter 2.4 (Quality, Reliability, Safety and Cybersecurity):

- New topics:
  - HW quality and reliability:
    - Digital twin – deeper look on the concept
    - Virtualization support
    - Simulation data and process management
    - Design to field – to improve test and modelling using field load simulator
    - SW/HW reliability in their interaction
  - Development of novel security and safety approaches with respect to energy and the impact on environment
- M.C. 5 updated from “Human Systems Interaction” to “Human Systems Integration”

# ECS-SRIA 2022 content updates Details (5)



Chapters 3.2, 3.3, 3.5, 3.6: general refresh, following the overall update guidelines

## Chapter 3.1 (Mobility):

- New/updated topics:
  - SW defined vehicle
  - Importance of new HW and SW architectures in electronics for mobility
  - Edge2cloud continuum in mobility
  - Influence of pandemic on long-term vision

## Chapter 3.4 (Health and wellbeing):

- Refreshed the role of Integrated Silicon Photonics and Flexible Electronics
- Alignment with Health.E lighthouse

## Chapter 4 (LTV):

- Complete restructuring and re-editing of the ECS long-term vision
- All the SRIA Chapters have been included

# Highlighting Interdependencies

## Global Timelines - Short-term example

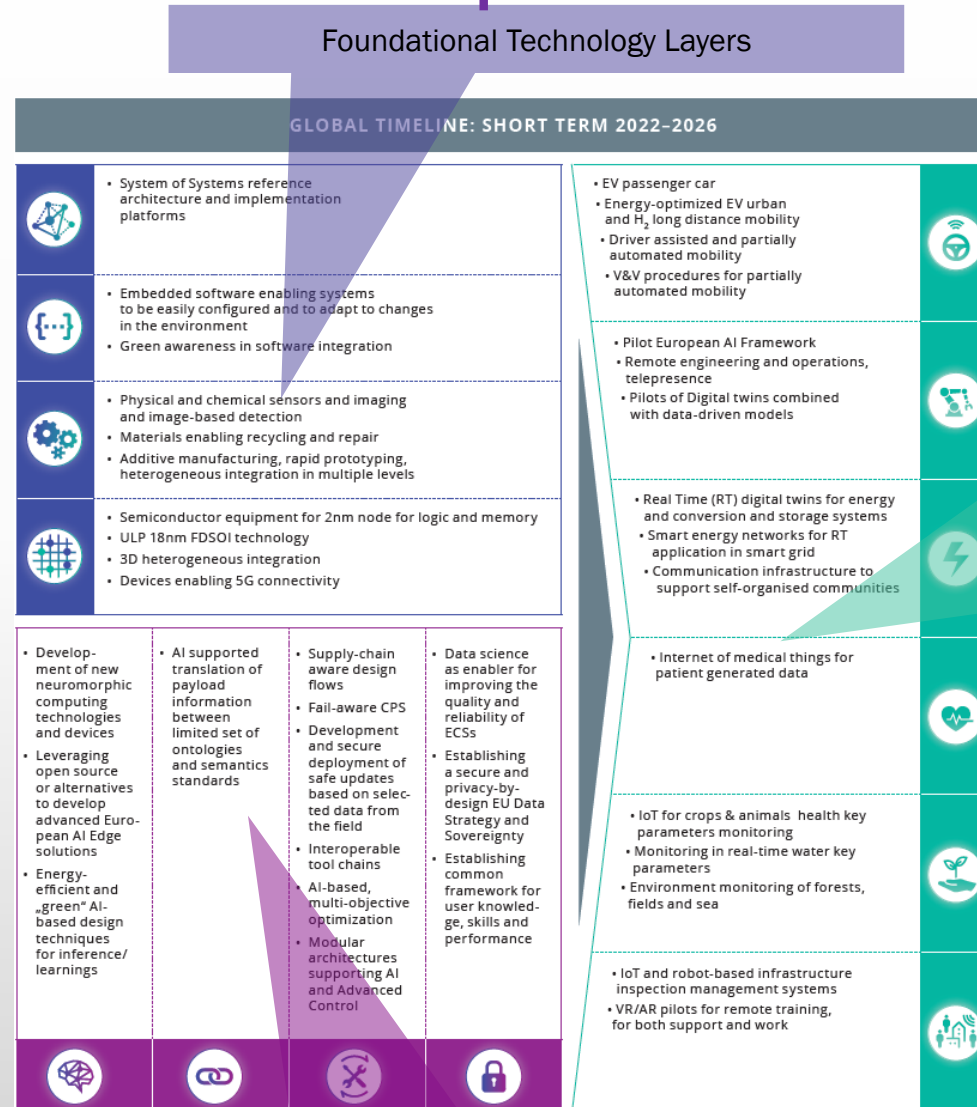


*Electronic Components and Systems*

► Compact view of main milestones foreseen over three periods:

- Short term (2022–2026):  
The industry has a **precise idea** of what must be achieved during that timeframe.
- Medium term (2027–2031):  
**Reasonably good knowledge** of what can possibly be achieved.
- Long term (2032 and beyond):  
Expected achievements are more of a **prospective nature**.

- Described features expected to be available as prototype or early commercialisation within that timeframe
- More detailed timelines available in each technology or application section



Cross-sectional technologies

Key Application Areas

# Global Timelines

## Synergies and interdependencies example



*Electronic Components and Systems*

GLOBAL TIMELINE: SHORT TERM 2022-2026										
<ul style="list-style-type: none"> <li>System of Systems reference architecture and implementation platforms</li> </ul>	<ul style="list-style-type: none"> <li>EV passenger car</li> <li>Energy-optimized EV urban and H<sub>2</sub> long distance mobility</li> <li>Driver assisted and partially automated mobility</li> <li>V&amp;V procedures for partially automated mobility</li> </ul>	<ul style="list-style-type: none"> <li>Pilot European AI Framework</li> <li>Remote engineering and operations, telepresence</li> <li>Pilots of Digital twins combined with data-driven models</li> </ul>	<ul style="list-style-type: none"> <li>Real Time (RT) digital twins for energy and conversion and storage systems</li> <li>Smart energy networks for RT application in smart grid</li> <li>Communication infrastructure to support self-organised communities</li> </ul>	<ul style="list-style-type: none"> <li>Internet of medical things for patient generated data</li> </ul>						
					<ul style="list-style-type: none"> <li>Embedded software enabling systems to be easily configured and to adapt to changes in the environment</li> <li>Green awareness in software integration</li> </ul>	<ul style="list-style-type: none"> <li>IoT for crops &amp; animals health key parameters monitoring</li> <li>Monitoring in real-time water key parameters</li> <li>Environment monitoring of forests, fields and sea</li> </ul>	<ul style="list-style-type: none"> <li>IoT and robot-based infrastructure inspection management systems</li> <li>VR/AR pilots for remote training, for both support and work</li> </ul>			
								<ul style="list-style-type: none"> <li>Physical and chemical sensors and imaging and image-based detection</li> <li>Materials enabling recycling and repair</li> <li>Additive manufacturing, rapid prototyping, heterogeneous integration in multiple levels</li> </ul>	<ul style="list-style-type: none"> <li>AI supported translation of payload information between limited set of ontologies and semantics standards</li> <li>Supply-chain aware design flows</li> <li>Fail-aware CPS</li> <li>Development and secure deployment of safe updates based on selected data from the field</li> <li>Interoperable tool chains</li> <li>AI-based, multi-objective optimization</li> <li>Modular architectures supporting AI and Advanced Control</li> </ul>	<ul style="list-style-type: none"> <li>Establishing a secure and privacy-by-design EU Data Strategy and Sovereignty</li> <li>Establishing common framework for user knowledge, skills and performance</li> </ul>
<ul style="list-style-type: none"> <li>Materials enabling recycling and repair</li> </ul>	<ul style="list-style-type: none"> <li>Advanced AI edge solutions leveraging open source or alternative strategies</li> </ul>	<ul style="list-style-type: none"> <li>Widespread deployment of sensors to monitor forests, fields and oceans</li> </ul>								

**Materials enabling recycling and repair**  
 CHP 1.2 - Components, Modules and System Integration

**Advanced AI edge solutions leveraging open source or alternative strategies**  
 CHP 2.1 - Edge Computing and Embedded Artificial Intelligence

**Widespread deployment of sensors to monitor forests, fields and oceans**  
 CHP 3.5 - Agrifood and Natural Resources

# ECS-SRIA Outline

<https://ecscollaborationtool.eu/publication/download/sria-global-outline-programme.pdf>



Electronic Components and Systems

Readability:  
Chapter scopes at a glance

KEY APPLICATION AREAS

CROSS-SECTIONAL TECHNOLOGIES

	2.1 - EDGE COMPUTING AND EMBEDDED ARTIFICIAL INTELLIGENCE	2.2 - CONNECTIVITY	2.3 - ARCHITECTURE AND DESIGN: METHODS AND TOOLS	2.4 - QUALITY, RELIABILITY, SAFETY AND CYBERSECURITY
1.4 - SYSTEM OF SYSTEMS	Hardware architectures and their implementation (Systems of Chips, Embedded architectures), for edge and near the user devices. Generic technologies for compute, storage and communication (generic embedded architectures) with the design quality properties, efficiency and cost effectively. Technologies for devices using Artificial Intelligence at the edge.	The connectivity and interoperability technology is focused on enabling the projected commercial and societal benefits that are related to the OSI model layers 1, 5 and 6.	Innovations, advancements and extensions in architectures, design processes and methods, and in corresponding tools and frameworks, that are enabling engineers to design and build innovative ECS-based applications with the design quality properties, efficiency and cost effectively.	Ensure quality, reliability, safety, dependability, privacy and security of ECS as a part of the Design, implementation, and Validation/Testing process of complex, heterogeneous and intelligent ECS, including human-systems interaction.
1.3 - EMBEDDED SOFTWARE AND BEYOND	Artificial intelligence to automatically manage the composition of ECPS in SoS and control their evolution. Artificial intelligence to improve automate interoperability. Distributed artificial intelligence to provide the level of automation required to monitor, to support decision making and to control the complexity of SoS.	Connectivity is a key enabler for SoS which, by definition, are composed of connected and distributed ECPS. Connectivity channels and their interfaces are at the base of the composition process from which SoS originate.	Engineering methodologies, tool chains and tools interoperability are fundamental to enable the definition of SoS architectures, the implementation of SoS platform and SoS management across their lifecycle. The heterogeneity of SoS requires automated engineering processes and toolchains, integrated between multiple stakeholders, brands and technologies, supporting efficiency, quality and sustainability.	End-to-end trust (security, privacy, reliability, etc.) covering the entire edge to cloud continuum (trust continuum) is a key factor for SoS. Trust must be preserved during the composition of ECPS in SoS and must be ensured during their evolution. Security, privacy, reliability, etc. must scale following the complexity of SoS, which requires automation to efficiently manage trust.
1.2 - COMPONENTS, MODULES AND SYSTEMS INTEGRATION	Facilitate engineering of embedded and cyber physical systems (ECPS), enabling digitalisation through the flexible and economically accountable building of larger software-enabled systems with desired quality. This layer covers new applications of ECPS, continuous integration and deployment. ECPS engineering and management across their lifecycle, including sustainability aspects. Starting from integrated hardware systems, this layer provides the embedded software (OS, libraries, virtualisation, middleware, etc.) required to produce fully functioning embedded and cyber physical systems.	ECPS are, for the vast majority, connected and this layer provides them with all the elements required to ensure field connectivity, inter-system communications and the capability to interact with cloud platforms. These elements are key to enable the composition of ECPS in SoS, and also for the inclusion of legacy systems.	Software engineering is exceeding the human scale, meaning it can no longer be overseen by a human without supporting tools, current and future ECPS, due to their complexity, require continuous hardware-software integration, both at component and system level. Continuous and automated engineering extends also to ECPS deployment and to their entire lifecycle. These necessities increase when considering embedded AI and new computing paradigms (e.g. neuromorphic).	Trust represents one the strongest barriers for the acceptance of ECPS and it must be ensured in embedded software, in particular for embedded AI. Trust should be ensured by design, and by ensuring it becomes an interdisciplinary solution because, at this level, many technology aspects converge in a single system: hardware, different layers of software, connectivity, development tools, etc. The quality of embedded software also plays a key role in ECPS.
1.1 - PROCESS TECHNOLOGY, EQUIPMENT, MATERIALS AND MANUFACTURING	Multidomain engineering for physical and functional heterogeneous integration of new physical entities at components, modules and system levels. Heterogeneous integration spans SoC, System-in-Package and layer modules and systems, including flexible electronics and photonics solutions. This layer generates hardware integrated systems including low level software (e.g. firmware and operating system drivers).	Smart components, modules and systems are the hardware key enablers for the embedded intelligence. The focus is on integrating machine learning and artificial intelligence on the sensor, module and systems level. New advanced, efficient and specialized processing architectures (based on CPU, embedded GPU, accelerators, neuromorphic computing, FPGAs and ASICs) to increase the edge computing performances and reduce power consumption. Low level software support to enable AI-based data analytics is provided.	Design and simulation methods that enable and support multi-physics and multimodal design, simulation, manufacturing and testing must be addressed (e.g. modeling and design tools for thermal, mechanical and electrical characteristics in 3D small packages). Focus cover also lifecycle engineering for optimized use for materials, for components, modules and systems condition monitoring, predictive maintenance, and to improve their recyclability.	Growing complexity of smart components, modules and systems represents a reliability challenge which requires the continuous improvement of existing methods (e.g. design for reliability) and development of new techniques (e.g. prognostic health management) for reliable ECS. The area also focuses on solutions for ensuring secure integration of systems, sensor level hardware and software security, privacy and data trustworthiness and AI Hardware safety.
	AI adoption covers both the electronic components and their manufacturing process. Additive manufacturing of the sensors (intelligence at the edge) and/or to the data sources (IoT), and integrate the components in a form factor that perfectly suits their applications. Use AI in the operation of semiconductor fabrication, to master complexity, increase reliability, shorten time to stable yield, improve competitive high-volume high-quality resource saving volume production of semiconductors	Provide process technologies and electronic components required for ECS hyper connectivity, including 5G/6G communications, advanced RF and photonics communication technologies to interface between semiconductor components, subsystems and systems.	Electronic design and automation methods and tools required to address security as silicon materials and metamaterials, the design and manufacturing process of future nano-scale systems and electronic components, including assembly and packaging of electronics on flexible substrates. Production tools for heterogeneous integration and to support flexible, sustainable, agile and competitive high-volume high-quality semiconductor manufacturing are also considered.	End to end security starts from semiconductors. New technologies to address security as silicon materials are considered, including application-specific logic; heterogeneous SoC, security by design, etc. Quality and reliability in the semiconductor production are also considered, focusing on maximising quality KPIs, monitor the process with AI, early detect yield/reliability issues, quality by design, etc. Quality and reliability in the semiconductor production are also considered, focusing on maximising quality KPIs, monitor the process with AI, early detect yield/reliability issues, quality by design, etc. Quality and reliability in the semiconductor production are also considered.



Chapter Synergies

### 3.1 - MOBILITY

Mobility is a basic human need and Europe's mobility industry is a key contributor to it, with a significant share in the global market in all mobility sectors (automotive, aerospace, maritime and rail). ECS take a fundamental role in mobility innovation for the final user, the society, the ecosystem and for European companies. The Green Deal and digitalisation are significantly influencing mobility, oriented to the reduction of CO<sub>2</sub> and other emissions (with electrification, alternative fuels but also more energy- and cost-efficient electronic and optoelectronic components, interconnected intelligent systems and AI-based embedded software), and to ensure an inclusive safe and secure mobility (e.g. with smart perception, affordable, safe and environmentally neutral light mobility, automated on- and off-road vehicles, and smart mobile machinery). The mobility market is increasing integration of automation functions, to evolve towards connected, cooperative and automated mobility, where ECS are essential building blocks, bringing to partial or fully automated vehicles; the focus is on affordable, automated and connected mobility for passengers and freight on road, rail, air and water; on tools and methods for validation and certification of safety, security and comfort of embedded intelligence in mobility, and on real-time data handling for multimodal mobility and related services.

### 3.2 - ENERGY

The Energy chapter focuses on the challenges of a society and industry more and more based on electrical energy, addressing energy generation, supply, conversion, and use, aiming at developing highly efficient, reliable and secure solutions to achieve a carbon neutral society by 2050. The chapters cover smart and efficient solutions to manage energy generation, conversion, and storage systems, solutions for the energy management from on-site to distribution systems, for future transmission grids, for a clean, efficient and resilient local energy supply and for energy systems monitoring and control. ECS play a central role in these solutions and, in conjunction with 5G, IoT, AI and cloud-edge computing, will strengthen the position of leading European companies in smart energy related markets (e.g. for electrical drives, grid technologies, and decentralised renewable energy sources). ECS increase also sustainability, improving the smooth implementation, integration and use of renewable energy resources and lowering the costs through new materials and semiconductors, new device architectures, innovative new circuit topologies, architectures, and algorithms, the total system cost can be lowered. ECS ensure a competitive, self-sufficient and efficient energy transmission and consumption in the EU, supporting decentralized intermittent energy sources, bi-directional grid and storage systems, and distributed AC/DC network and grid technologies.

### 3.3 - DIGITAL INDUSTRY

The Industry 4.0 have a profound impact on how factories, construction zones and processes are managed and operated. Powerful networked digital solutions are needed to support discrete manufacturing (e.g. manufacturing of automobiles, trains, airplanes, satellites, white goods, furniture, toys and smartphones), process industries (e.g. chemical, petrochemical, food, pharmaceuticals, pulp and paper, and steel), provisioning, and also production services, connected machines and robots. Employs also given to any type of factories, productive plants and operating sites, value chains, supply chains and lifecycles. ECS and digitalisation represent a key enabler for the future success of European industry sector and this chapter focuses on their integration, development of responsive, smart and sustainable production, artificial intelligence in digital industry, industrial services, digital twins and autonomous systems and robotics. The objective is to increase the level of automation, digitisation and decision making, to support demand-driven and agile production, condition monitoring and maintenance, to improve sustainability through energy, waste, material, recycling optimisation, to improve production and supply chains resilience and responsiveness, and to strengthen key European value chains with digital infrastructures and added value services based on ECS.

### LONG TERM VISION

The Long Term Vision chapter addresses research subjects to enable and support effective development of European industry in about a decade from today. The chapter build upon the challenges identified by the ECS-SRIA and specify long-term industrial needs. These needs are the basis for research programs for effective research and development in appropriate technological and/or application domains, so that European technological strength increases continuously in time and at the appropriate pace. Since lead time from a first scientific breakthrough (TRL) to the market presence of related products (TRL) is about 10 years, the effective industrial needs is a determining factor for the identification and funding of research and innovation. The Long Term Vision is shaped by three main factors: technology, application domains and policies. All factors are drivers of innovation, because (i) anticipated technological advances lead to innovative applications of these advances and (ii) user needs lead to technological innovations that enable these efforts. At the same time, policies and politically established goals and processes lead technologies and applications towards common goals and targets such as the goals and targets of the Green Deal and the European Industrial competitiveness. It is apparent that, each of these factors need to be shaped and initiates innovation efforts at many levels.

### 3.4 - HEALTH AND WELLBEING

The healthcare industry is facing a radical change, enabled by its current digital transformation in combination with a change towards a personalized medicine, the so called P4 healthcare (predictive, preventive, personalised, participatory). Related developments in healthcare electronics, healthcare data and healthcare technologies will progressively generate a new ecosystem positioning the "healthcare consumer" at the centre of the value chain. The ecosystem will rely on digital instruments, advanced electronic sensors and photonics, micro-electromechanical systems (MEMS), and the large volume, high-quality, low-cost production capabilities of the ECS industry. ECS will play a key role to enable the development of tools, data, platforms, technologies and processes for improved prediction, prevention, interception, diagnosis, treatment and management of diseases. The objectives include a better understanding of the determinants of health and priority disease areas, a reduction of the fragmentation of health R&D efforts bringing together health industry sectors and other stakeholders, the creation of people-centred digital health platforms based upon P4 healthcare, the exploitation of digitalisation and data exchange in health care, the development of the home as the central location of the patient, the development of a more integrated care delivery system and the creation of solutions to ensure more healthy life years for an ageing population.

### 3.5 - AGRIFOOD AND NATURAL RESOURCES

Electronic components and smart systems are vital for the sustainable production and consumption of safe and healthy food, for sustainable practices in agriculture, livestock, aquaculture, fisheries and forestry, access to clean water, fertile soil and healthy air for all, and also to enhance biodiversity and protect the productive ecosystems. This chapter focuses on ECS-based technologies (e.g. smart IoT solutions, traceability frameworks, robots, drones, AI) to ensure livestock and crop health, access to farming systems and food supply systems, food and crop production and management. ECS are also at the base of soil health, air quality and environment smart integrated monitoring solutions, as well as smart waste management systems and remediation methodologies. Moreover, the chapter focuses on the key role that IoT systems can play in water quality monitoring, management and access to clean water, including the smart treatments of wastewater, rainwater and stormwater. Finally, the chapter covers ECS-based solutions for biodiversity restoration and ecosystem resilience, conservation and preservation, to ensure the natural sustainability of healthy ecosystems and their resources (agriculture, aquaculture, fisheries and forestry). The objectives of the chapter are aligned with the key Horizon Europe missions and with the European Green Deal.

### 3.6 - DIGITAL SOCIETY

Digital Society chapter covers digital innovations that are essential to promote an inclusive and healthy society, constructive solutions for European challenges in the fields of health, mobility, security, energy and the climate, and consequently to European economic prosperity. Europe needs digital solutions that strengthen the industries and at the collective level to empower society as a whole. These (smart) digital solutions will be driven by new technologies such as 5G, Artificial Intelligence with deep learning, virtual and augmented reality, brain-computer interfaces and robotics. They will shape new ways of how people use and interact with these technological solutions, with each other, and with society and the environment. Digital innovations should facilitate individual self-fulfillment, empowerment and resilience, collective "inclusion" and safety, as well as supportive infrastructure and sustainable environment. The ethical aspects of the digital transformation are also considered, trying to address societal concerns in a sustainable way, guaranteeing participation and reducing inequality. A human-centred approach is therefore a key aspect of the EU's approach to technology development. It is part of European social and ethical values, social inclusiveness, and the creation of sustainable, high-quality jobs through social innovation.



# Chapter cross references

To highlight the synergies between Chapters and provide hints to the reader, cross-references have been introduced alongside the text.

**PAGE MAIN TEXT**

ECS-SRIA 2022 — Strategic Research and Innovation Agenda for Electronic Components and Systems

**Lifecycle-aware holistic design flows**  
 "Closing the loop" - i.e. collecting relevant data in the operation phase, analysing it (using AI-based or other methods) and feeding it back into the development phase (using digital twins, for example) - is the focus of this research topic. It is closely related to the major challenges "Continuous integration and deployment" and "Lifecycle management" in Chapter 1.3, which examines the software part of ECS, and Major Challenges 1 and 2 in Chapter 2.4.

Closing the loop includes data collected during operation of the system on all levels of the hierarchy, from new forms of misuse and cyber-attacks or previously unknown use cases and scenarios at the system level, to malfunctions or erroneous behaviour of individual components or modules. Analysing this data leads to design optimisations and development of updates, eliminating such errors or implementing extended functionality to cover "unknowns" and "incidents".

Data on physical aspects of the ECS must also be collected and analysed. This includes design for optimised manufacturing and deployment, awareness of physical effects and interferences, consideration of end-of-life (EOL) of a product and recycling options within a circular economy.

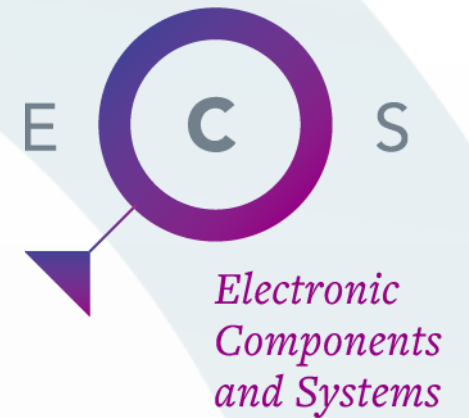
All of these aspects must be supported by new approaches for multi-level modelling, analysis, verification and formalisation of ECS's operational reliability and service life (c.f. previous challenges), including a consequent

**CROSS-REFERENCES**

- Chapter icon
- Chapter number

Cross-references indicate that the topic described in the main text is linked to the referenced Chapter.

# Improved Readability: Keyword index



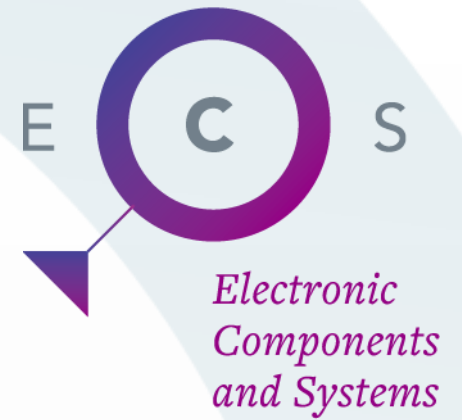
New “**Keywords Index**”, to quickly search key topics and simplify the SRIA “navigation” jumping directly to them.

## A

abstraction	105
accelerators	465
access control as a service (ACaaS)	442
actuating	44



# How to use it?



Project : Infrastructure-based collision avoidance system

- Protecting all road users
- Sensors at crossroads
- Collision prediction based on trajectory, with self-learning capabilities
- Communicating warning signals if needed

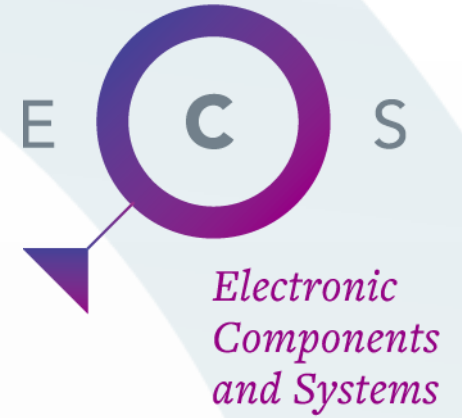
How to argue for relevance?

Check for research issues?

# How to use it? (2)

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## Keywords index

- V2X



### 3.1.4.3.2 Key focus areas

The following research, development and innovations areas and their subtopics have been identified:

Dependable and affordable environment perception and localisation sensors, and V2X communication. Attention should be paid to sensor interference, more in particular the **robustness of sensors to environmental conditions**, to interference by other sensors and to **malicious interference**.

## Plain text search

- Road safety



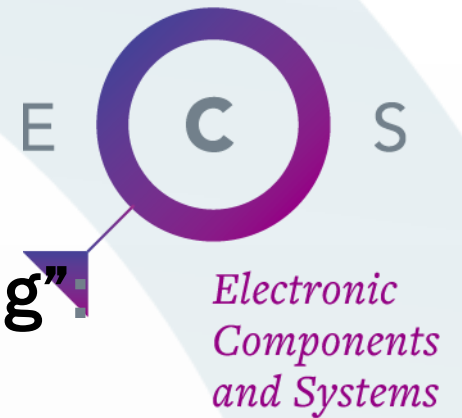
In the mobility application area, the provision of improved, robust, secure and interoperable connectivity will support breakthroughs regarding **Increasing road safety** through the CCAM programme.

- Self-learning



Third, **self-learning** techniques (Federative learning, unsupervised learning, ...) will be necessary for fast and automatic adaptation.

# ECS SRIA and KDT calls 2022



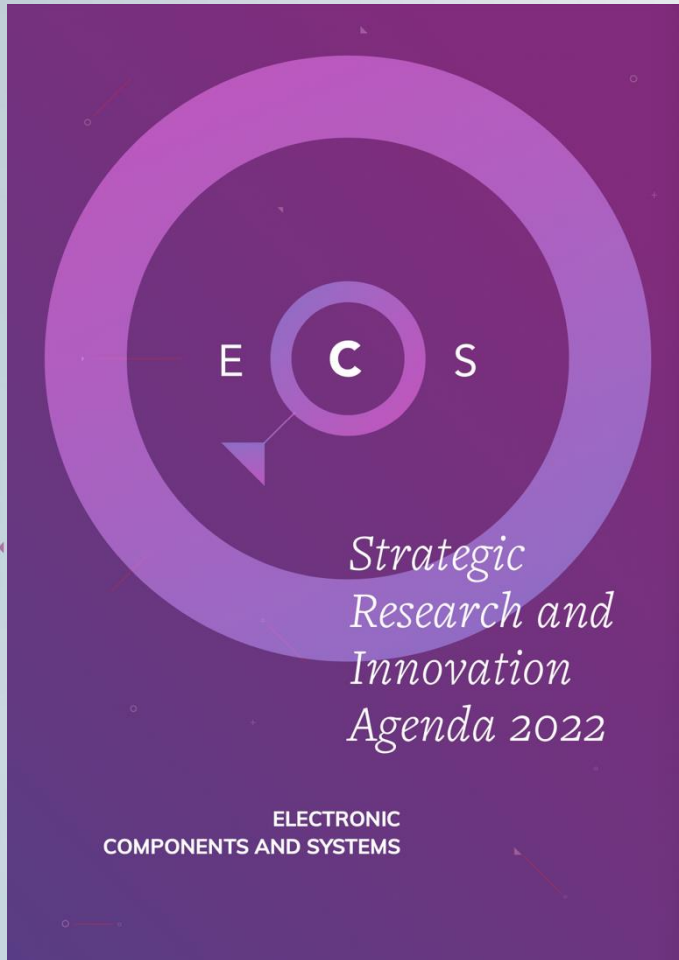
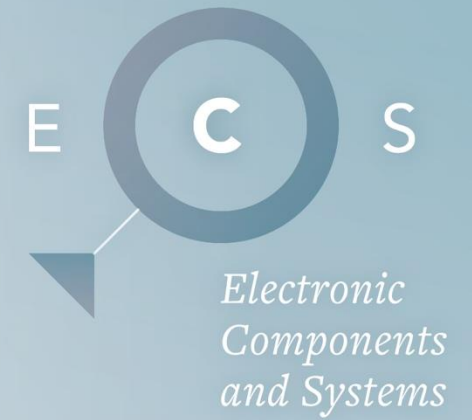
SRIA 2022 basis for KDT calls 2022 “Bottom-up Programming”

- Both IA and RIA
- All Major Challenges of all SRIA Chapters 1.1 to 3.6 “Open” in the calls

For Focus Topics:

- Refer to call text
- SRIA can help as complement, mainly for
  - Industrial supply chain for silicon photonics (IA)
  - Ecodesigned smart electronic systems supporting the Green Deal objectives (RIA)

Plans to integrate inputs of RISC-V working group into 2023 SRIA update



# ECS-SRIA

Thanks for the attention.  
Any question?