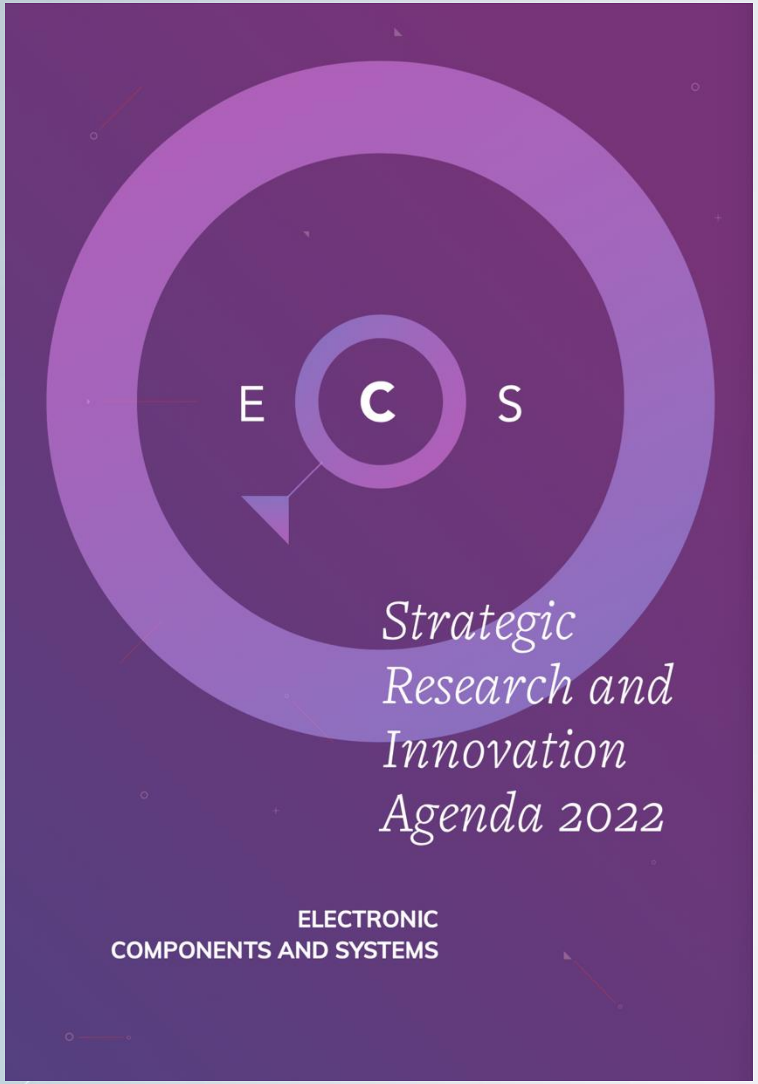


Electronic Components and Systems

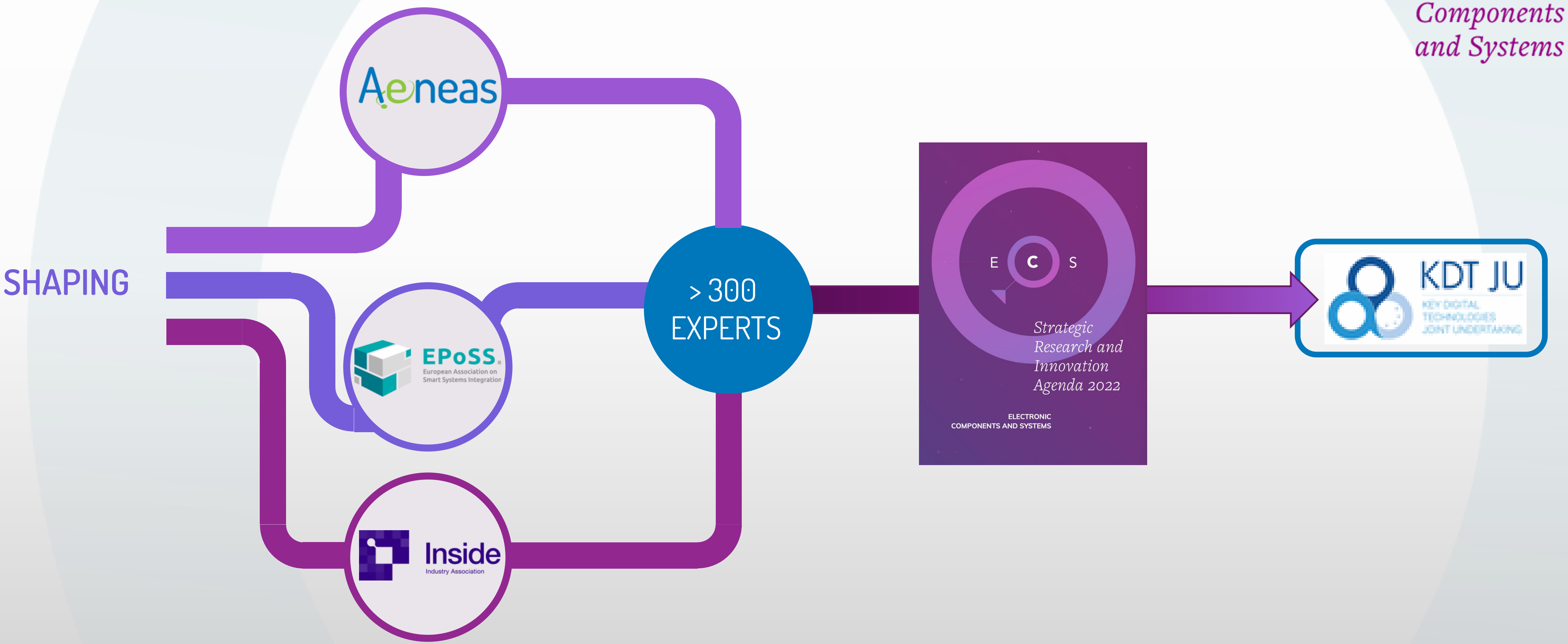
ECS SRIA 2022

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



The SRIA for the ECS value chain

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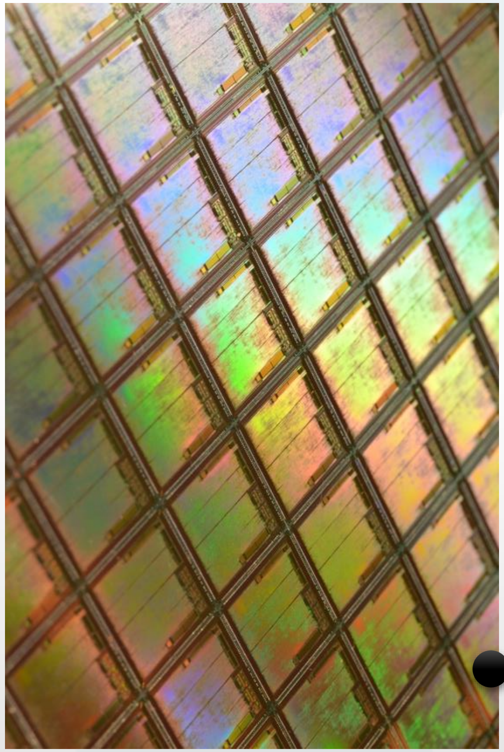
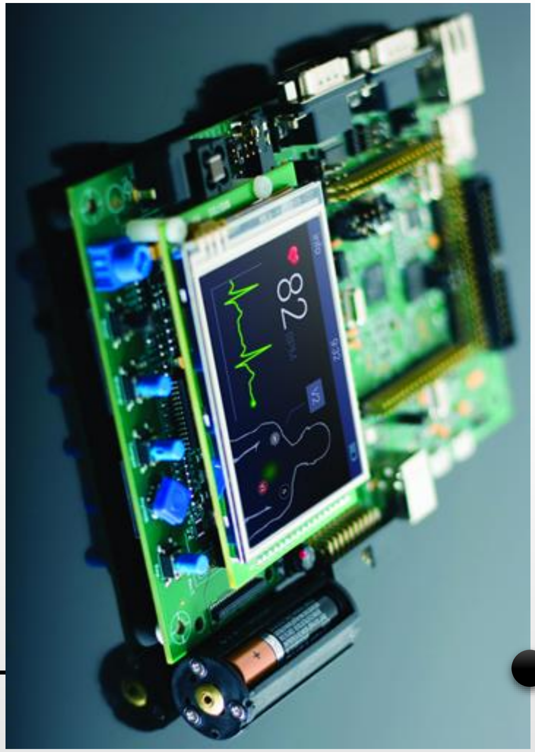


Materials, processes, semiconductors, micro & nano electronic components, …



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

Systems and applications, value creation, societal goals, …

ECS engineering tools

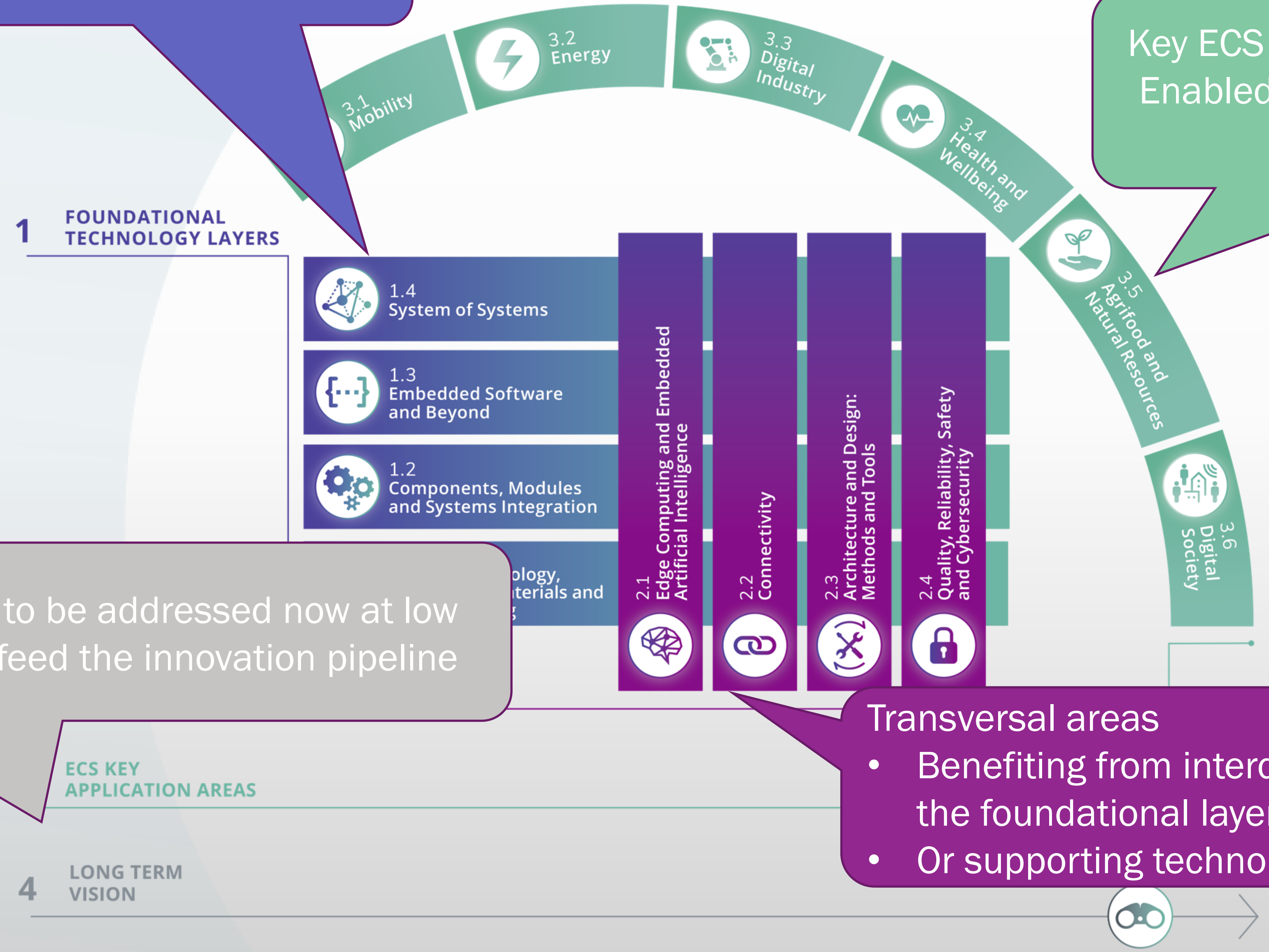
ECS COLLABORATION TOOL

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



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

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

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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.

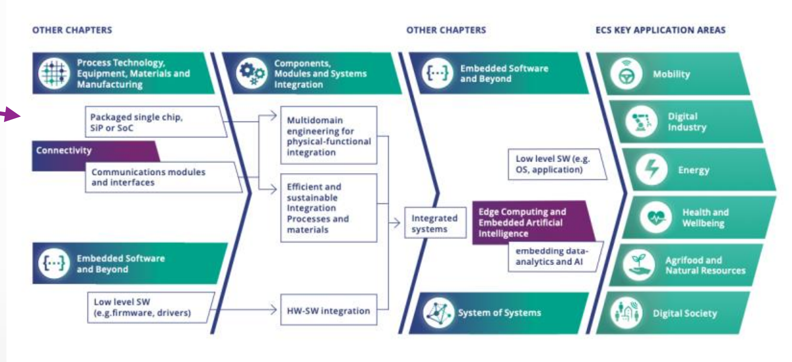
New leaders for some chapters.

New contributors in almost all the chapters.

ECS-SRIA 2022 content updates Details (1)

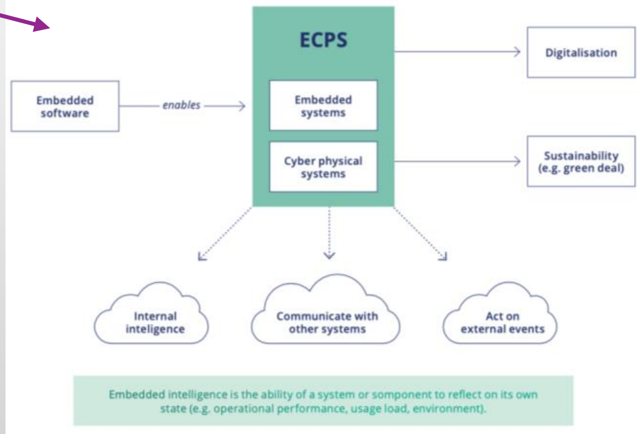
Chapters 1.1 and 1.2 (- Process Technology, Equipment, Materials and Manufacturing - Components, Modules and Systems Integration **):**

- 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)

Electronic Components and Systems

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)

Electronic Components and Systems

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)

Electronic Components and Systems

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)

Electronic Components and Systems

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

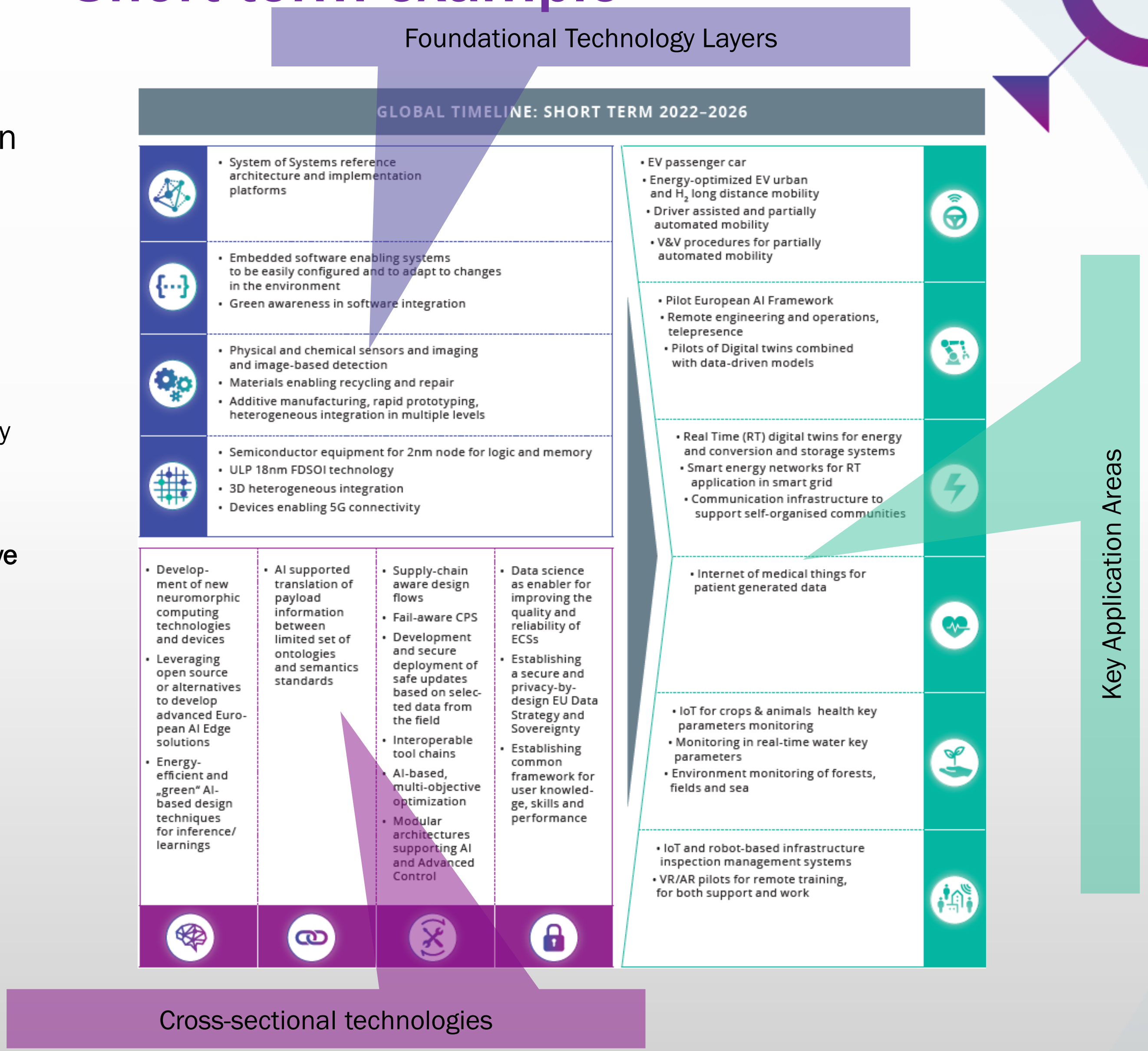
Chapter 4 (LTV):

- 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

- 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



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Global Timelines
Synergies and interdependencies example

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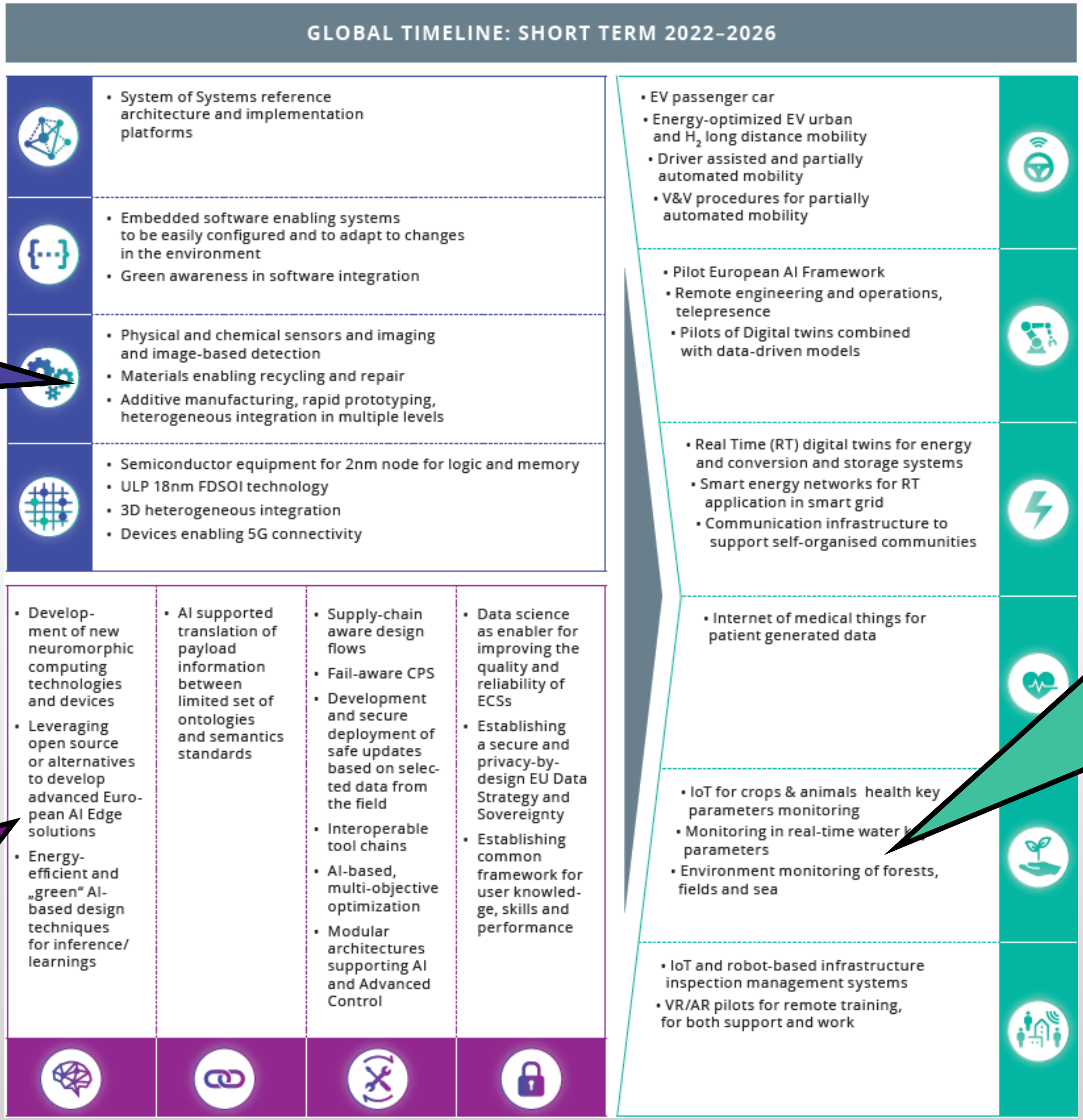
Materials enabling recycling and repair
CHP 1.2 - Components, Modules and System Integration

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

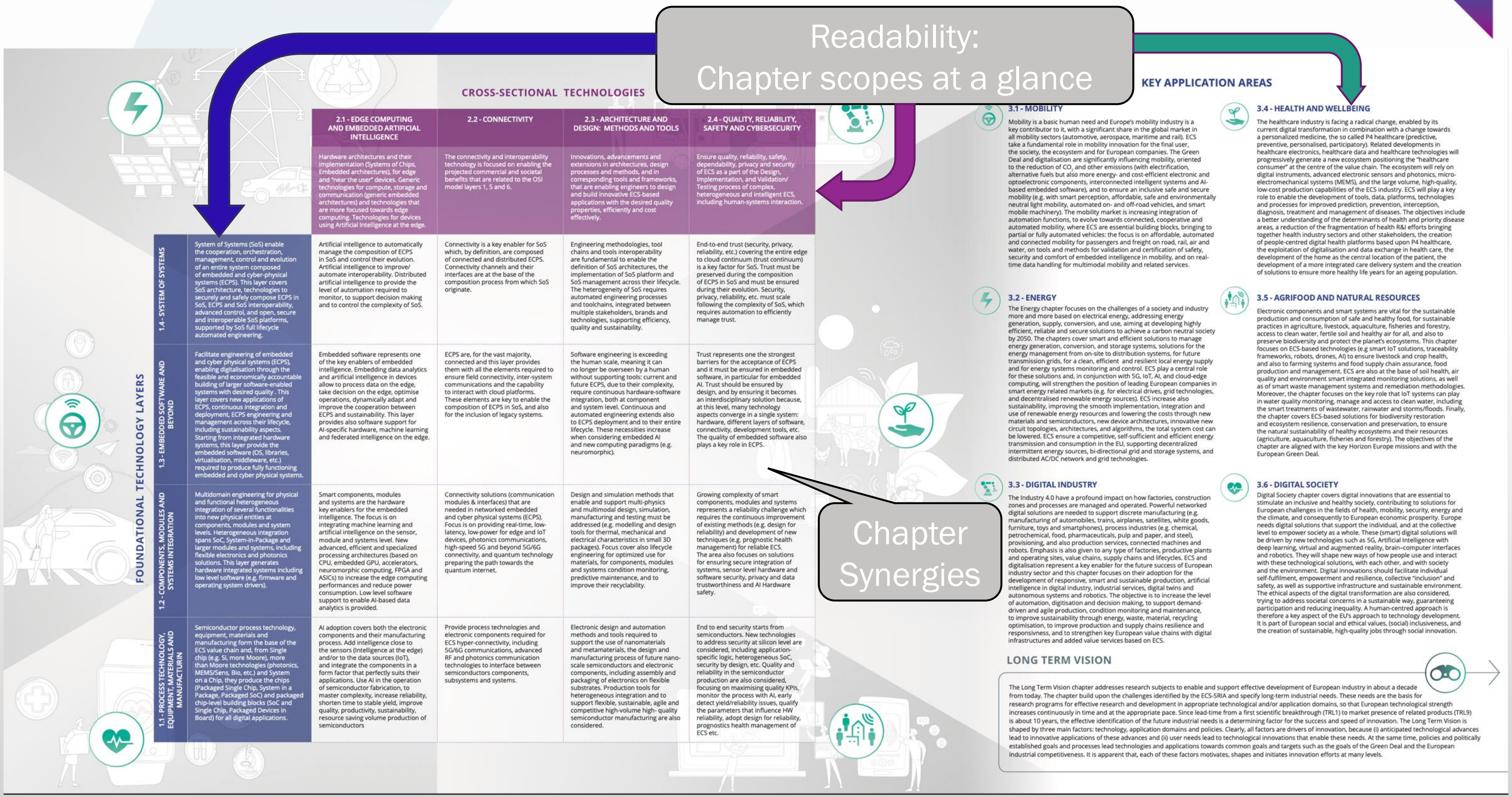
Widespread deployment of sensors to monitor forests, fields and oceans
CHP 3.5 - Agrifood and Natural Resources



ECS-SRIA Outline

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

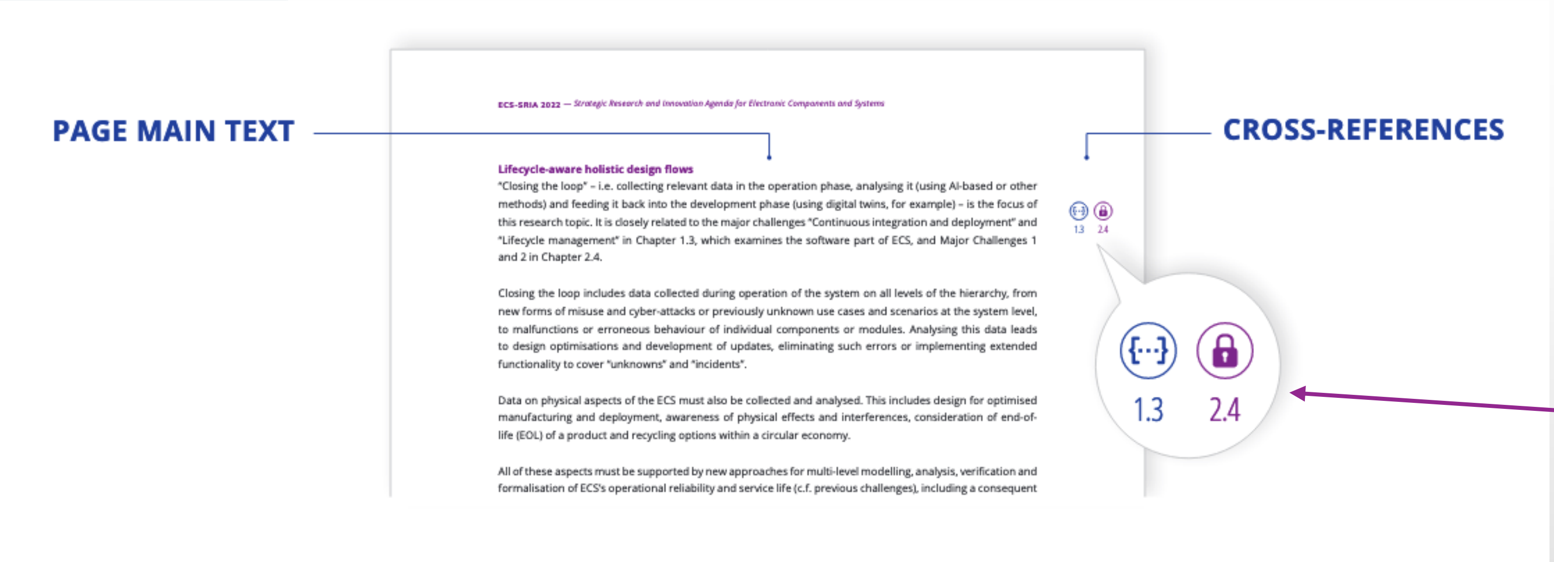
Electronic Components and Systems



Chapter cross references

Electronic Components and Systems

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

- 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

E C S

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

How to use it?

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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)

Electronic Components and Systems

Table of contents

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
- Self-learning

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.

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

ECS SRIA and KDT calls 2022

Electronic Components and Systems

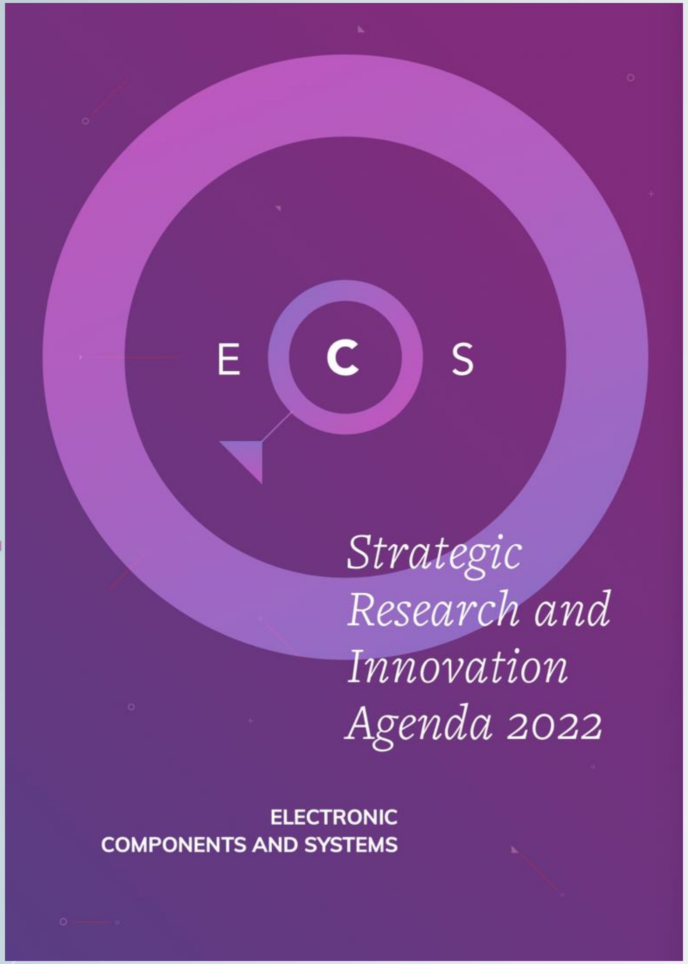
SRIA 2022 basis for KDT calls 2022 “Bottom-up Programming”:

- 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



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Thanks for the attention.

Any question?

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