ECS - SRIA 2021
A MAJOR UPDATE

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History

2014
3 Separate SRAs

2018
1 Common ECS SRA

2021
1 Common ECS SRIA

WHAT'S NEW?
1 SRIA with added I for innovation
2 Funding-programme agnostic document looking 15 years ahead
3 Basis for the KDT SRIA 2021

ECSEL JU

KDT

2030

EUREKA Clusters (Penta, Euripides, etc.)
A great TEAM effort

January 15, 2020:

- Kick-off for ECS-SRIA 2021 in Brussels

The ECS-SRIA 2021 Team:

- **12** Core Team Members
- **53** Section Leaders
- **299** Contributors

Are you willing to contribute to the 2021 ECS-SRIA?

- Yes: **79%**
- No: **21%**

ECS Brokerage; January 2021: 199 respondents
ECS-SRIA 2021: What is new?

- New Structure (Introduction in Chapter 0)
- Analysis of all Major Challenges = 4 Main Objectives
- Global Timelines (short term, mid term and long term)
- Broadened Scope (Integrated photonics and flexible electronics topics)
- Common Glossary
  (SRIA definitions of specific terms: APPENDIX p. 419 ff.)
- Executive Summary
Executive Summary

To be published soon!
New structure

1. Foundational Technology Layers
   - 1.1 Process Technologies, Equipment, Materials and Manufacturing
   - 1.2 Components, Modules and Systems Integration
   - 1.3 Embedded Software and Beyond
   - 1.4 System of Systems

2. Cross-Sectional Technologies
   - 2.1 Artificial Intelligence, Edge Computing and Advanced Control
   - 2.2 Connectivity
   - 2.3 Architecture and Design Methods and Tools
   - 2.4 Quality, Reliability, Safety and Cybersecurity

3. ECS Key Application Areas
   - Mobility
   - Energy
   - Digital Industry
   - Health and Wellbeing
   - Natural Resources
   - Digital Society
EU Main Objectives taken up by SRIA

- Boost industrial competitiveness through interdisciplinary technology innovations

- Ensure European digital autonomy through secure, safe and reliable ECS supporting key European application domains

- Establish and strengthen sustainable and resilient ECS value chains supporting the Green Deal

- Unleash the full potential of intelligent and autonomous ECS-based systems for the European Digital Age
EU Main Objectives in SRIA Chapters

**Industrial Competitiveness**
- Boost industrial competitiveness through interdisciplinary technology innovations
- Ensure EU sovereignty through secure, safe and reliable ECS supporting key European application domains

**EU Sovereignty**
- Establish and strengthen sustainable and resilient ECS value chains supporting the Green Deal

**Sustainability and Green Deal**
- Unleash the full potential of intelligent and autonomous ECS-based systems for the European Digital Era

**European Digital Era**
- EU Sovereignty
- Sustainability and Green Deal

**Boost industrial competitiveness through interdisciplinary technology innovations**
- 1.1.2 Novel devices and circuits that enable advanced functionality
- 1.1.3 Advanced heterogenous integration and packaging solutions
- 1.1.4 World-leading and sustainable semiconductor equipment and manufacturing technologies
- 1.2.2 Investigate innovative connectivity technology (new spectrum or medium) and new approach to improving existing one in order to maintain EU long-term leadership
- 1.2.3 Autonomous interoperability translation for communication protocol, data encoding, compression, security and information semantics
- 1.2.4 SoS interoperability
- 1.2.5 Composability of embedded and cyber-physical systems in SoS
- 1.3.2 Challenge 2 (safety): Enable affordable safe and environment neutral light Mobility (Bikes, tricycles, wheelchairs, small drones, …) and mobile machinery (as smart farming) and lifestyle related diseases
- 1.3.3 Responsive and smart production
- 1.3.4 Embedding Data Analytics and Artificial Intelligence
- 1.3.5 Biodiversity restoration for Ecosystems Resilience, Conservation and Preservation
- 1.4.2 SoS interoperability
- 1.4.3 Composability of embedded and cyber-physical systems in SoS
- 1.5.1 Challenge 1 (climate and energy): Enable electrification & sustainable alternative fuels
- 1.5.2 Challenge 2 (safety): Enable affordable safe and environment neutral light Mobility (Bikes, tricycles, wheelchairs, small drones, …) and mobile machinery (as smart farming) and lifestyle related diseases
- 1.5.3 Responsive and smart production
- 1.5.4 SoS interoperability
- 1.5.5 Composability of embedded and cyber-physical systems in SoS
- 2.1.1 Increasing the energy efficiency of computing systems
- 2.1.2 Increasing the energy efficiency of computing systems
- 2.1.3 Supporting the increasing lifespan of devices and systems
- 2.1.4 Ensuring European sustainability in AI, edge computing and advanced control
- 2.1.5 Challenge 5 (real-time data handling): Achieve real-time data handling for multimodal mobility and related services
- 2.1.6 Human Systems Integration
- 2.2.1 Strengthening EU connectivity technology portfolio in order to maintain leadership, secure sovereignty and offer an independent supply chain
- 2.2.2 Investigate innovative connectivity technology (new spectrum or medium) and new approach to improving existing one in order to maintain EU long-term leadership
- 2.2.3 Autonomous interoperability translation for communication protocol, data encoding, compression, security and information semantics
- 2.2.4 Architectures and reference implementations of interoperable, secure, scalable, smart and evolvable IoT and SoS connectivity
- 2.2.5 Autonomous interoperability translation for communication protocol, data encoding, compression, security and information semantics
- 2.3.1 Extending Development Processes and Frameworks
- 2.3.2 Challenge 4 (safety): Provide tools and methods for validation & certification of safety, security and comfort of embedded intelligence in mobility
- 2.3.3 Responsive and smart production
- 2.3.4 Managing new functionality in safe, secure, and trustworthy systems
- 2.3.5 Architectures and reference implementations of interoperable, secure, scalable, smart and evolvable IoT and SoS connectivity
- 2.3.6 Autonomous interoperability translation for communication protocol, data encoding, compression, security and information semantics
- 2.4.1 Efficient Engineering of Embedded Software
- 2.4.2 Ensuring dependability in connected software
- 2.4.3 Ensuring cyber-security and privacy
- 2.4.4 Ensuring of safety and resilience
- 2.4.5 Human Systems Integration
- 2.5.1 Challenge 1 (climate and energy): Enable electrification & sustainable alternative fuels
- 2.5.2 Managing new functionality in safe, secure, and trustworthy systems
- 2.5.3 Autonomous interoperability translation for communication protocol, data encoding, compression, security and information semantics
- 2.5.4 SoS interoperability
- 2.5.5 Composability of embedded and cyber-physical systems in SoS
- 2.6.1 Challenge 2 (safety): Enable affordable safe and environment neutral light Mobility (Bikes, tricycles, wheelchairs, small drones, …) and mobile machinery (as smart farming) and lifestyle related diseases
- 2.6.2 Facilitate empowerment and resilience
- 2.6.3 Autonomous systems, robotics
- 2.6.4 SoS interoperability
- 2.6.5 Composability of embedded and cyber-physical systems in SoS
- 2.7.1 Challenge 1 (climate and energy): Enable electrification & sustainable alternative fuels
- 2.7.2 Challenge 2 (safety): Enable affordable safe and environment neutral light Mobility (Bikes, tricycles, wheelchairs, small drones, …) and mobile machinery (as smart farming) and lifestyle related diseases
- 2.7.3 Responsive and smart production
- 2.7.4 SoS interoperability
- 2.7.5 Composability of embedded and cyber-physical systems in SoS
- 3.1.1 Efficient Engineering of Embedded Software
- 3.1.2 Challenge 2 (safety): Enable affordable safe and environment neutral light Mobility (Bikes, tricycles, wheelchairs, small drones, …) and mobile machinery (as smart farming) and lifestyle related diseases
- 3.1.3 Challenge 1 (climate and energy): Enable electrification & sustainable alternative fuels
- 3.1.4 Challenge 4 (safety): Provide tools and methods for validation & certification of safety, security and comfort of embedded intelligence in mobility
- 3.1.5 Challenge 5 (real-time data handling): Achieve real-time data handling for multimodal mobility and related services
- 3.1.6 Facilitate inclusion and collective safety
- 3.2.1 Achieving Highly Efficient Urban/ Regional Energy Supply
- 3.2.2 Investigate innovative connectivity technology (new spectrum or medium) and new approach to improving existing one in order to maintain EU long-term leadership
- 3.2.3 Achieving Highly Efficient Urban/ Regional Energy Supply
- 3.2.4 Cross-Sectional Tasks for Energy System Monitoring & Control
- 3.2.5 Digital twins, mixed or augmented reality, telepresence
- 3.2.6 Facilitate empowerment and resilience
- 3.3.1 Responsive and smart production
- 3.3.2 Challenge 4 (safety): Provide tools and methods for validation & certification of safety, security and comfort of embedded intelligence in mobility
- 3.3.3 Autonomous systems, robotics
- 3.3.4 Managing Diversity
- 3.3.5 Digital twins, mixed or augmented reality, telepresence
- 3.3.6 Autonomous systems, robotics
- 3.4.1 Enable digital health platforms based upon P4 healthcare
- 3.4.2 Enable the shift to value-based healthcare, enhancing access to 4Ps game changing technologies
- 3.4.3 Support the development of home as the central location of the patient, building a more integrated care delivery system
- 3.4.4 SoS interoperability
- 3.4.5 Ensure more healthy life years for an ageing population
- 3.5.1 Food Security
- 3.5.2 Food Safety
- 3.5.3 Water resource management
- 3.5.4 Biodiversity restoration for Ecosystems Resilience, Conservation and Preservation
- 3.5.5 Biodiversity restoration for Ecosystems Resilience, Conservation and Preservation
- 3.6.1 Facilitate individual self-fulfilment
- 3.6.2 Facilitate empowerment and resilience
- 3.6.3 Facilitate inclusion and collective safety
- 3.6.4 Facilitate supportive infrastructure and a sustainable digital twin
- 3.6.5 Biodiversity restoration for Ecosystems Resilience, Conservation and Preservation
- 3.6.6 Facilitate inclusion and collective safety
- 3.7.1 Challenge 1 (climate and energy): Enable electrification & sustainable alternative fuels
An example

3.1.4.1 Electrification & sustainable alternative fuels
3.1.4.2 Affordable safe and environmentally neutral light mobility
3.1.4.3 Affordable, automated and connected mobility

<table>
<thead>
<tr>
<th>Year</th>
<th>Objective</th>
</tr>
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<tbody>
<tr>
<td>2030</td>
<td>-37.5% CO2 reduction vs. 2021</td>
</tr>
<tr>
<td>2040</td>
<td>Zero emission in cities</td>
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<tr>
<td>2050</td>
<td>Zero net emission</td>
</tr>
</tbody>
</table>

3.3.4.1 Responsive and smart production
3.3.4.2 Sustainable production

3.4.4.1 Digital health platform based upon P4 healthcare
3.4.4.2 Shift to value-based healthcare
3.4.4.3 Home as the central location of the patient
3.4.4.4 Personalised & participative treatments
3.4.4.5 Ensure more healthy life years for an ageing population

2030: -37.5% CO2 reduction vs. 2021
2040: Zero emission in cities
2050: Zero net emission

Electronic Components and Systems

Home as the central location of the patient
Personalised & participative treatments
Ensure more healthy life years for an ageing population
### MILESTONES TO BE REACHED VIA COLLABORATIVE RESEARCH PROJECTS ACROSS EUROPE

<table>
<thead>
<tr>
<th>Timeline</th>
<th>SHORT TERM (2021–2025)</th>
<th>MEDIUM TERM (2026–2030)</th>
<th>LONG TERM (2031 AND BEYOND)</th>
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<tbody>
<tr>
<td><strong>Industrial competitiveness</strong></td>
<td>Additive manufacturing, rapid prototyping</td>
<td>Modular multi-application architecture supporting AI and advanced sensing and control</td>
<td>Advanced human-machine joint intelligence</td>
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<td></td>
<td></td>
<td>Remote engineering and operations, telepresence</td>
<td>Time-critical functions moved to the cloud</td>
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<td>Cost- and effort-effective, continuous virtual ECS development and validation processes</td>
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<td><strong>EU sovereignty</strong></td>
<td>Zero defect design and manufacturing and circular economy for ECS</td>
<td>Certified trusted hardware and embedded software for autonomous systems</td>
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<td>EU devices enabling 5G connectivity</td>
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<td></td>
<td>Leveraging open source or alternatives to develop advanced European AI edge solutions</td>
<td>6G connectivity RF and photonics devices</td>
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<td>New self-learning methods to ensure safe operations of complex systems</td>
<td>End-to-end AI-based security</td>
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<td></td>
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<td>1 nm node semiconductor equipment</td>
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<td></td>
<td></td>
<td></td>
<td>Quantum and other novel paradigm technologies for computing, communication and sensing</td>
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<td></td>
<td><strong>Sustainability and Green Deal</strong></td>
<td>EU ecosystems for dependable SW</td>
<td>Trustable AI-based IoT systems</td>
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<td>Materials enabling recycling and repair</td>
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<td>Supply-chain aware design flows</td>
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<td>Energy-optimised EV urban mobility</td>
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<td>New Power devices Energy management towards low/zero power</td>
<td>Food Traceability over the whole value chain</td>
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<td>Energy-optimised H₂ long-distance mobility</td>
<td>Organic, compostable and biodegradable materials</td>
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<td>Reduction of cumulated carbon and cultivated land footprint by 20% in the next 20 years</td>
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<td><strong>Europe's Digital Age</strong></td>
<td>Emission-free cities</td>
<td>From cradle to grave CO₂-neutral mobility</td>
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<td>Communication infrastructure to support self-organised communities</td>
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<td></td>
<td>IoT-based health care solutions</td>
<td>Real-time emotion sensing</td>
<td>Organ-on-a-chip developments addressing rare diseases</td>
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<td></td>
<td>Sensing and processing for clean, connected and automated vehicles</td>
<td>Validation and certification procedures for clean, connected and automated vehicles</td>
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<td></td>
<td>Improved and new human-machine interfaces</td>
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<td>Next generation (patch-like) drug delivery systems part of the Internet of Medical Things</td>
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Global Timelines

“A journey of a thousand miles begins with a single step”
- From Tao Tö King, circa 400 BC

Selected milestones over three time periods
- Short term (2021–2025):
  The industry has a precise idea of what must be achieved during that timeframe.
- Medium term (2026–2030):
  Reasonably good knowledge of what can possibly be achieved.
- Long term (2031 and beyond):
  Expected achievements are more of a prospective nature.

Described features expected to be available as ECS at TRL levels 8–9 (prototype or early commercialisation) within that timeframe

Detailed timelines available in each technology or application section

https://fr.wikipedia.org/wiki/Lao_Tseu
Global Timelines
Short term example

Materials enabling recycling and repair
- Components, Modules and System Integration
- Foundational Technology

Advanced AI edge solutions leveraging open source or alternative strategies
- Artificial Intelligence, Edge Computing and Advanced Control
- Cross-Sectional Technology

Widespread deployment of sensors to monitor forests, fields and oceans
- Agrifood and Natural Resources
- Key Application Area
Promoting Synergies

Within the SRIA

Potential new breakthroughs in applications

From application roadmaps to ECS technology requirements

ECS SRIA in the Global Landscape

Electronic Components and Systems

And many others...
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A MAJOR UPDATE

Open for your feedback and contribution until December 14th, 2020

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