Chapter 2.3
Architecture and Design: Methods and Tools

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Scope

- Key enablers to produce ECS-based applications and innovations:
  - Effective architectures and platforms at all levels of the design hierarchy
  - structured and well-adapted design methods and development approaches supported by efficient engineering tools, design libraries and frameworks

- Establishing architectures, methods and tools that enable "quality by design" approaches for future ECS-based systems

CONTINOUS DEVELOPMENT AND INTEGRATION (DevOps)
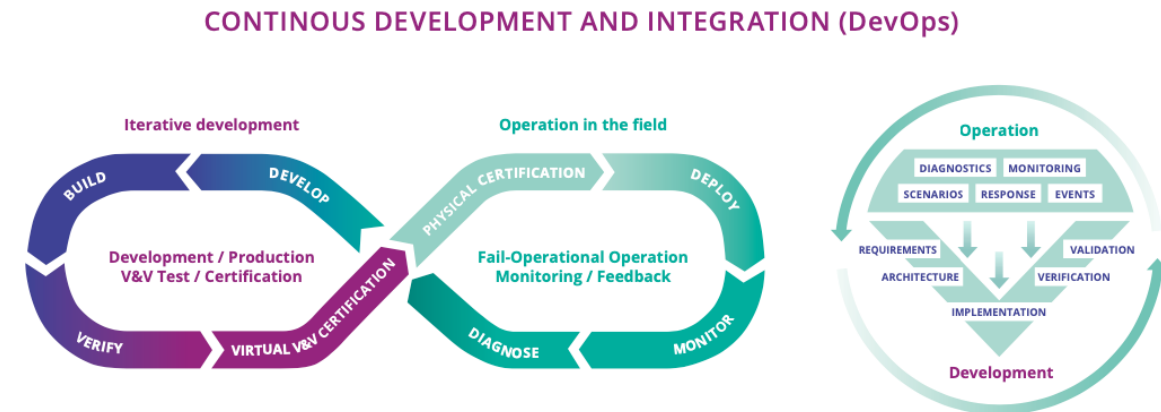
Key trends

- Ever increasing funtionality ('intelligence') and complexity of ECS based systems comrising heterogeneous ('diverse') subsystems and components

- Agile continous development processes by using data collected during run-time (and production, maintenance,…)

- Advanced functionality by use of AI in components and subsystems, with corresponding challenges for qualtiy (ie., safety) assurance

- Advanced productivity and cost-effectiveness by using AI in Development and Test, with corresponding challenges for quality assurance

- Sustainability / 'green'
  - Systems
  - Design, Integration and Test Processes

Major challenges

- MC 1: Enabling cost- and effort-efficient Design and Validation Frameworks for High Quality ECS

  New

- MC 2: Enabling Sustainable Design for Sustainability

  New

- MC 3: Managing complexity

- MC 4: Managing diversity

R&I focus areas

MC 1: Enabling cost- and effort-efficient Design and Validation Frameworks for High Quality ECS

1.1. Lifecycle-aware holistic design flows
1.2. Virtual Engineering of ECS
1.3. Advancing System and component design (methods and tools)
1.4. Integration of new V&V methods

MC 2: Enabling Sustainable Design for Sustainability

2.1. Lifecycle aware Design Optimizations
2.2. Updates
2.3. Energy and resource efficient test procedures and equipment
2.4. Ultra-low power design methods

MC 3: Managing complexity

3.1. Assurance Cases
3.2. Methods and tools to increase design and V&V efficiency
3.3. Complexity reduction methods and tools for V&V and testing
3.4. Methods and tools for advanced architecture

MC 4: Managing diversity

4.1. Multi-objective design and optimisation of components and systems
4.2. Modelling, analysis, design and test methods for heterogeneous systems considering properties, physical effects and constraints
4.3 Automation of analogue and integration of analogue and digital design methods
4.4. Connecting the virtual and physical world of mixed domains in real environments