Lero | Ireland's Space Industry Directory

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Overview

Lero is the Irish Research Centre for Software Engineering, combining Software Engineering expertise from six Irish universities, 30 academics, 30+ research fellows and postdocs, and c. 100 PhD students.

Service Domains

- Satellite Technology
- Satellite Applications

Technology Domains

- Space System Software
- System Design & Verification

Expertise

Lero has nearly ten years’ experience of world-class research in all aspects of software engineering. Lero’s expertise covers every stage of the software development lifecycle, from requirements definition, through design, modelling, implementation, and deployment, to runtime monitoring and adaptation. Lero researchers have successfully guided many companies to improve their software-related processes and products, from start-ups to major multinationals such as IBM and the European Space Agency (ESA).

Lero’s space research is led by its director Prof. Michael Hinchey. Mike previously served as director of the NASA Software Engineering Laboratory, at Goddard.
Space Flight Center, Greenbelt, MD. His groundbreaking work in space exploration software reliability, correctness, and self-management has led to more than 20 patents.

Main Space related products, services and projects

As part of the successful Methods and Tools for On-Board Software Engineering (MTOBSE) project, Lero has provided software and consultancy services to ESA in three areas:

Future space missions to remote locations will require sophisticated levels of autonomy, due to long round-trip signal times. Lero researchers are leading the development of KnowLang, a formal language for the specification of advanced autonomous systems. KnowLang supports early detection and analysis of emergent behaviours and unexpected interactions between autonomy goals, thus helping engineers to ensure that requirements for on-board systems are correct at design time.

On-board software for space missions is typically subject to stringent safety standards. Lero researchers have assisted ESA with mathematical techniques to formally verify that software meets its specified requirements and is error-free. This software verification process can be applied in conjunction with an appropriate verified hardware platform, to ensure the correctness of entire on-board systems.

In aerospace domains, product variants are often needed to meet the demands of different markets and missions. As more variants are created, it can become increasingly difficult to handle software updates and improvements that need to be propagated across multiple products. In support of the Space Avionics Open Interface Architecture (SAVOIR) and Component Oriented Development Techniques (CORDET) initiatives, Lero has provided ESA with techniques for handling system families, or software product lines, systematically using interactive configuration tools, visualisations and model transformations.