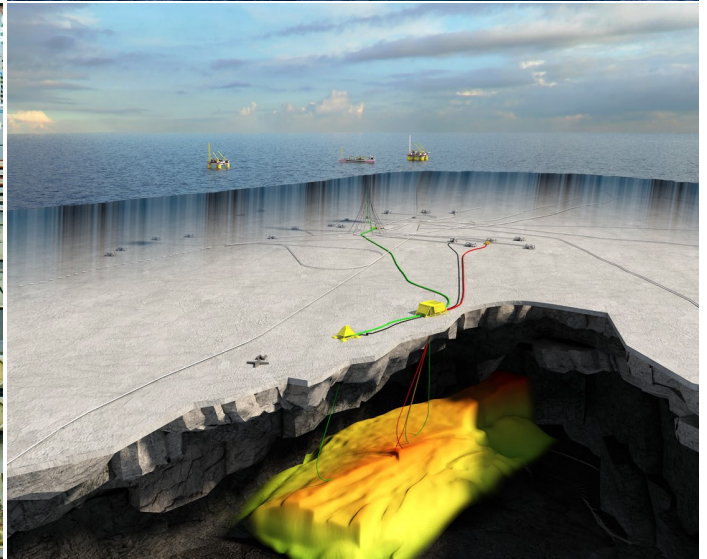# SIRIUS
Centre for Scalable Data Access in the Oil and Gas Domain

Developing and demonstrating smart ways of finding and getting data through:

- Collaboration between oil companies, service companies, IT vendors and universities.

- Industry-near research and innovation: experiments, prototypes and pilots.

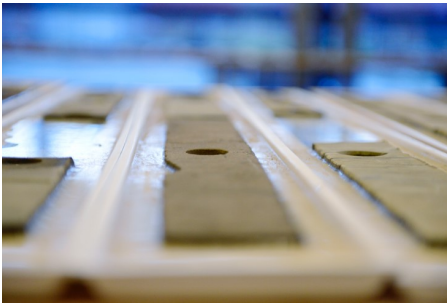- Applications and demonstrations in exploration and operations.

SIRIUS

UiO **: University of Oslo**

sfi Centre for Research-based Innovation
The Research Council of Norway

# Experiments, Pilots and Prototypes to Meet Industrial Challenges

Exploration

The exploration work-package supports the business processes in the sub-surface part of the oil and gas business: exploration, geosciences, reservoir modelling and wells. Our ambitions are to:

- Open up sub-surface data so that it is accessible to end-users
- Manage the large variety of standards and data representations used
- Ensure that large volumes of data, such as seismic, can be used effectively.
- Break down silo-based work processes.
- Develop easier and cheaper methods for ensuring data quality.

SIRIUS projects are improving methods used to process language in oil and gas documents. SIRIUS is also working with the Department of Geosciences at the University of Oslo to demonstrate how national data repositories and other data bases can be opened up for easier data access. SIRIUS researchers are also working with reservoir simulators and high-performance computer vendors to improve speed of reservoir models.
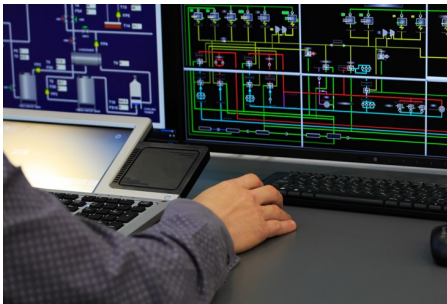
Operations

The operations work-package supports the business processes in facility development, operations, maintenance and logistics, i.e. the rest of the oil and gas supply chain. SIRIUS projects apply simulation and formal analysis to problems in planning of maintenance, commissioning and logistics. We are also working with projects that will improve the effectiveness and reduce the cost of engineering through better management of requirements and design information. Finally, we work on ensuring that digital twins can be implemented and integrated quickly, easily and effectively.

Data access is a bottleneck in all processes for improving operations. SIRIUS projects lay a foundation for improving the flow and availability of useful operational information. Faster, better decisions will be the result.

Cross-Domain Applications

The methods and technologies developed by SIRIUS can be used outside the oil and gas industry. In particular, there is scope for cross-fertilisation with applications to health and medicine. SIRIUS researchers are active in the BIGMED project, a Norwegian lighthouse project in personalised medicine and big data in healthcare. We are also working on projects that demonstrate how scalable data access can improve information flow and speed of decisions in hospitals.

Other areas of application are earth observation, renewable energy, smart cities and the internet of things. We believe that SIRIUS can be a catalyst for transfer of skills and resources from the oil and gas sector to new sources of prosperity.

Interdisciplinary Research in a Shared Laboratory

SIRIUS Strands and the SIRIUS Laboratory

Large-scale data access challenges need interdisciplinary solutions. SIRIUS brings together researchers from seven disciplines to work together on SIRIUS projects. Research results will be made available through the SIRIUS Laboratory, a shared, open-source repository of software and data. Innovations will be fostered through innovation projects, where the knowledge in the Laboratory is combined with partners' intellectual property to produce new products and services.

S1 Knowledge Representation

Data is always related to things or ideas. Getting access to data is simpler if we can link that data to its underlying thing or idea. Knowledge Representation looks at how we can represent knowledge about a domain, such as oil and gas, so that information can be found, shared and managed more effectively. Our tools include semantic technologies and logic.

S2 Natural Language

Documents, unstructured data, are an essential, perhaps dominant, part of the information used in the oil and gas industry. The Natural Language activity in SIRIUS looks at how processing of text using machine learning methods can be improved for use with oil and gas documents. This will allow faster and easier access to the content in oil and gas documents.

S3 Databases

Effective methods for scalable data access need back-end support from powerful and optimized databases. Knowledge representation methods are more effective if implemented with a fast and robust graph database. The Database group in SIRIUS, centred around the University of Oxford, works on these problems, using the RDFox graph database.

S4 Execution Modelling and Analysis

The oil and gas industry is full of complex systems. These systems are technical, such as cloud systems or organisational, like maintenance programs. Simulation and formal methods of analysis can improve and optimise the performance of these systems. This makes operations safer, more efficient and more profitable.

S5 Scalable Computing

All technologies for scalable data access demand substantial computing resources. For this reason SIRIUS works on high-performance computing and cloud computing. Our focus is on how specialised hardware, processors and switches in particular, can be used to improve the speed of databases, simulators, knowledge representation tools and machine learning.

S6 Work Practices

Scalable data access is useful to the extent that it allows companies to work in a smarter way. For this reason we are researching on how technology is used in oil and gas organisations. This research is led by social scientists from NTNU.

S7 Data Science and Machine Learning

Scalable data access is a prerequisite for successful data science projects, SIRIUS is building a research program in data science and is part of the DataScience@UiO program. We also work closely with the BigInsight Centre for Research-Based innovation.

The SIRIUS Consortium

Twelve companies in the oil and gas supply chain are partners in SIRIUS. They provide cash and in-kind contributions to the centre and its projects. Our partners cover all parts of the oil and gas industry's digital supply chain, from IT vendors to oil companies.

Facts and Figures

♦ Eight-year project from 2015-2023.

♦ Financed by the Research Council of Norway, University of Oslo and consortium partners

♦ Centre for Research-Based Innovation.

♦ Organized as a research group in the Department of Informatics at the University of Oslo.

♦ Currently 45 affiliated researchers in centre.

Contact

Prof. Arild Waaler   Centre Director   arild@ifi.uio.no   +47 228 40055

Dr. David Cameron   Centre Coordinator   davidbc@ifi.uio.no   +47 228 50446

Lise Reang   Administration Manager   liserea@ifi.uio.no   +47 228 40851

SIRIUS Centre for Scalable Data Access

Department of Informatics

University of Oslo   8th Floor, Staircase D, Ole-Johan Dahls hus

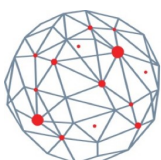PO Box 1080 Blindern   Gaustadalléen 23B

0316 Oslo

www.sirius-labs.no