SOFTWARE DEFINED APPLICATION INFRASTRUCTURES MANAGEMENT AND ENGINEERING

DURATION:
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www.sodalite.eu

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SODALITE will provide tools to enable simpler and faster development, deployment, operation and execution of heterogeneous apps in HPC, Cloud & SW defined computing environments

The SODALITE Whitepaper #1

EMPOWERING THE DEVOPS WORLD

The SODALITE Vision

In recent years, the global market has seen a tremendous rise in utility computing, which serves as the back-end for practically any new technology, methodology or advancement from healthcare to aerospace. As part of that market, however, many trends, such as Industry 4.0 and Internet of Things (IoT), promise to push the resources of the EU off the rails if these trends' requirements are not properly managed and supported by needed specific ICT software technology.

SODALITE vision is to support Digital Transformation of European Industry through increasing design and runtime effectiveness of software-defined infrastructures, to ensure high-performance execution over dynamic heterogeneous execution environments; increasing simplicity of modelling applications and infrastructures, to improve manageability, collaboration, and time to market. This is achieved by providing application developers and infrastructure operators with tools that abstract their application and infrastructure requirements to enable simpler and faster development, deployment, operation, and execution of heterogeneous applications reflecting diverse circumstances over heterogeneous, software-defined, high-performance, cloud infrastructures, with a particular focus on performance, quality, manageability, and reliability.

WHY SODALITE

The SODALITE Value

Effectiveness

Increasing application effectiveness through the run-time application of applicable performance improvements from the abstracted model to the deployed application.

Flexibility

Deploying an application onto heterogeneous compute targets (e.g., x86, ARM, GPU, FPGA) with response times suitable for real-world deployment.

Deployment Continuity

Enabling static optimisation of the so-abstracted applications onto specific infrastructure.

Speed

Reducing the time spent on software development, packaging, and deployment of applications requiring software-defined heterogeneous HPC.

A WIDE RANGE OF APPLICATIONS

The SODALITE Use Cases

SODALITE aims to provide an optimised, highly resilient heterogeneous execution environment enabling operational transparency between Cloud and HPC infrastructures. SODALITE technologies are applied and demonstrated in the following diverse range of use cases, highlighting a mixture of Cloud and HPC scenarios across varying workloads and unique infrastructure requirements:

In-silico clinical trials for spinal operations

Assessment and decision-support system for spinal operations consisting of a data store component, capable of providing efficient data access from heterogeneous compute resources and simulation process chain facilitating comprehensive data analytics for in-silico clinical trials.

Vehicle IoT

An innovative system demonstrator that enables data from heterogeneous sources (principally IoT devices) to be spread across a distributed processing architecture in line with end-user expectations (e.g. response time for contextualised service offerings) and needs (privacy preferences).

GPU Snow

An innovative tool demonstrator which enables the capillary observation of the continuous health status of mountain environments supporting social engagement of societies in software-aided continuous monitoring of Alpine regions.

What are people talking about SODALITE?

An External Point of View

The SODALITE External Advisory Board (EAB) Inaugural Meeting was convened to obtain strategic advice from peers external to the SODALITE project. Members are accomplished and experienced leaders sourced from both the research sector and industry. The scope of the EAB is to cover all aspects of the project, from technology development to market strategy and business modelling, to securing IPR and developing short to medium term post-project strategies.

Nicolas Ferry
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Senior Research Scientist at SINTEF Digital

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> *SODALITE has the potential to deliver solid innovations, validated in large pilots, towards the deployment and operation of the next generation of applications that will run on heterogeneous HPC and Cloud resources.*
>
> *Nicolas Ferry*

Andreas Metzger
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Head of Adaptive Systems and Big Data Applications at paluno; Deputy Secretary General at BDVA; NESSI SC Vice Chair

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> *The SODALITE outcomes are an impressive next step to facilitate efficiently deploying and operating complex, adaptive software across the whole compute continuum.*
>
> *Andreas Metzger*

Mark Parsons
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Professor at EPCC at The University of Edinburgh

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"A powerfull Stack"

The SODALITE Impact

SODALITE's toolset will be a powerful tool for digital innovation and transformation in the European Industry towards Industry 4.0. SODALITE's toolset:

Increases design and runtime effectiveness of software defined infrastructures, to ensure high-performance execution over dynamic heterogeneous execution environments.

Enhances simplicity of modelling applications and infrastructures for better manageability, stronger collaborations and a faster time to market.

Increases productivity of scientists and researchers by abstracting the complexity of heterogeneous infrastructures and hardware technologies, thus enabling ease of use for end user.

Enables optimal utilisation of resources in a datacenter or supercomputing facility which results in energy efficiency and reduced cost.

How Does It Work?

"The SODALITE Technology"

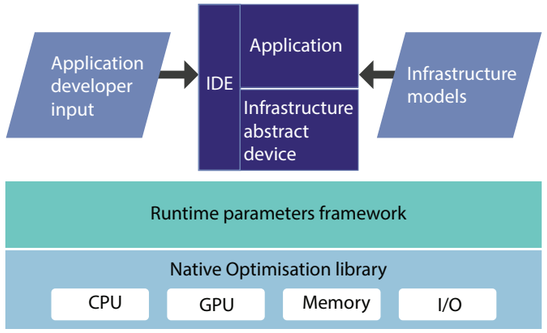
SODALITE attempts to bring the vast knowledge of performance optimisation accrued by the HPC industry over decades into the cloud computing area. Moreover, it aims at exploiting a model-driven approach, empowered by ontological reasoning, to support Application DevOps experts in configuring, deploying and operating their complex applications on heterogeneous resources.

Performance abstractions are provided in various forms, to be used in combination with the hardware abstractions and the Runtime system.

The SODALITE optimisation abstraction framework is summarised in the diagram below. Through the use of the IDE, application developers build code using abstract devices that lean on the infrastructure models, which resolve to certain native instantiations of the application tuned for execution on the given hardware. Additional runtime parameters are able to be applied, further improving application performance.

SODALITE will produce several **tangible results**:

- A **pattern-based abstraction library** that includes application, infrastructure, and performance abstractions.
- An **automatic Infrastructure as Code** (IaC) engine that not only facilitates the development process, but also reduces deploying errors and consequently the required time and cost.
- A **design and programming model** for both full-stack applications and infrastructures based on the abstraction library.
- A **deployment framework** that enables the static optimization of abstracted



applications onto specific infrastructure.

- Automated static and run-time **optimization and management of applications**.

Thanks to these results, SODALITE will be able to address the needs of the following actors:

- **Application Ops Experts**. They are in charge of operating the applications and, as such, are in charge of all the aspects that refer to its deployment, execution, optimization and monitoring. They know the applications to execute and its requirements in terms of both deployment/execution environment and quality of service.
- **Resource Experts (RE)**. They are in charge of dealing with the different resources required to deploy and execute the application. RE are in charge of application component technologies, of cloud, HPC, and GPU-based computing infrastructures, or of middleware solutions for both storing data and allowing components to communicate.
- **Quality Experts (QE)**. They are responsible for the quality of service both provided by the execution infrastructure and required by the executing application. Being part of the SODALITE ecosystem, they are in charge of offering libraries of patterns for addressing specific performance and quality problems in the SODALITE applications.

WHO WE ARE

The Consortium

Sodalite

TALK TO US

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