Modelling of Simulation Workflows
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Motivation and Project Objectives

We develop an integrative simulation environment supporting different scientific domains.

- Easy-to-use environment for: modelling, testing, debugging, repairing and execution of simulation workflows
- Flexible, robust, user-friendly, enabling human interaction
- Management of data and information in scientific workflows
- Data provisioning
- Support for multiple data sources: sensors, databases, etc.
- Visualization of simulation results, visualization workflows, utilization of GPUs
- Support for integration of scientific computations, simulation software and hardware resources

Main tasks of the project “Modelling of Simulation Workflows” are to:

- Define a meta-model for scientific workflows and
- A modelling language specification defining syntax and semantic of constructs
- Develop an enhanced workflow modelling tool for modelling of simulation procedures in an intuitive manner adapted for scientists
- Define and implement a service catalogue

Modelling Extensions

Data Stream
- Support and integration of stream data from various sources with heterogeneous formats and frequency.
- Extension of workflow meta-model defining modelling constructs for stream processing, e.g. filtering, synchronization, disaggregation of data streams

Shared Context
- A simulation scope packages common context information of multiple simulation workflows and other shared data
- Enables support for multi-scale and multi-physics simulations with sequential and parallel simulation runs
- Synchronization and coupling mechanisms for multi-scale and multi-physics simulations in order to associate multiple simulation models corresponding to one common, real world phenomenon

Support for Choreography
- Enables data exchange between simulations
- The changes in one simulation can be immediately adopted in the other one, while the involved processes are running
- Choreography definition for multi-scale and multi-physics simulations

Flexibility
- Definition of break points enables a scientist to modify the workflow to get the desired course, if it deviates from the expectations
- Break points can be used to change the workflow structure, add, re-execute, remove activities or correct erroneous data
- Meta-model extension for and integration of break points in the prototype

Prototype

- Architecture and prototype of modelling tool with separate perspectives corresponding to each lifecycle phase of simulation process management
- Integration of data management activities using data reference to deal with data intensive scientific experiments – both meta-model and implementation level
- Extensions of meta-modell, modelling language and implementation of
  - data management activities
  - service catalogue
  - data references
  - perspectives

References