Modular Science: Towards Online Multi Application Coordination

on Inhomogeneous High Performance Computing and Neuromorphic Hardware Systems

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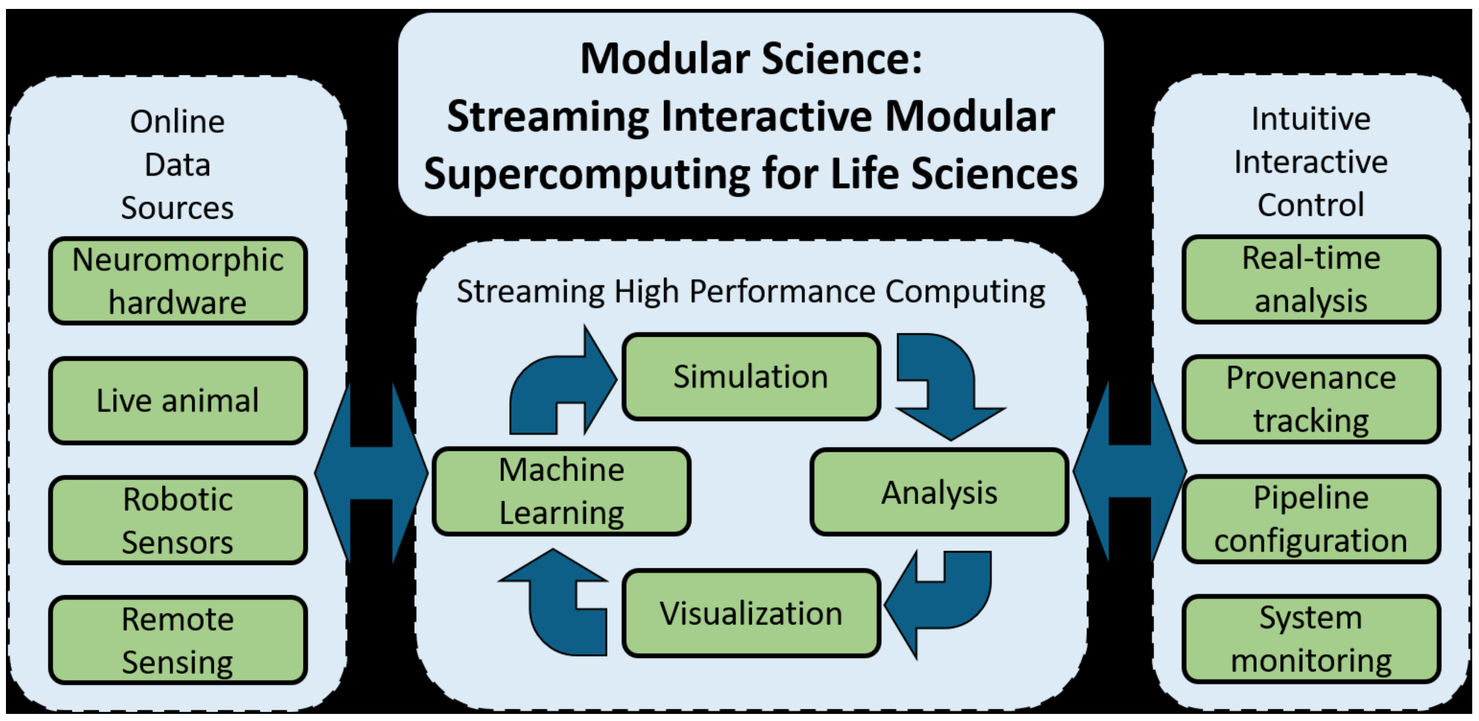
High-performance computing workflows in neuro & life sciences

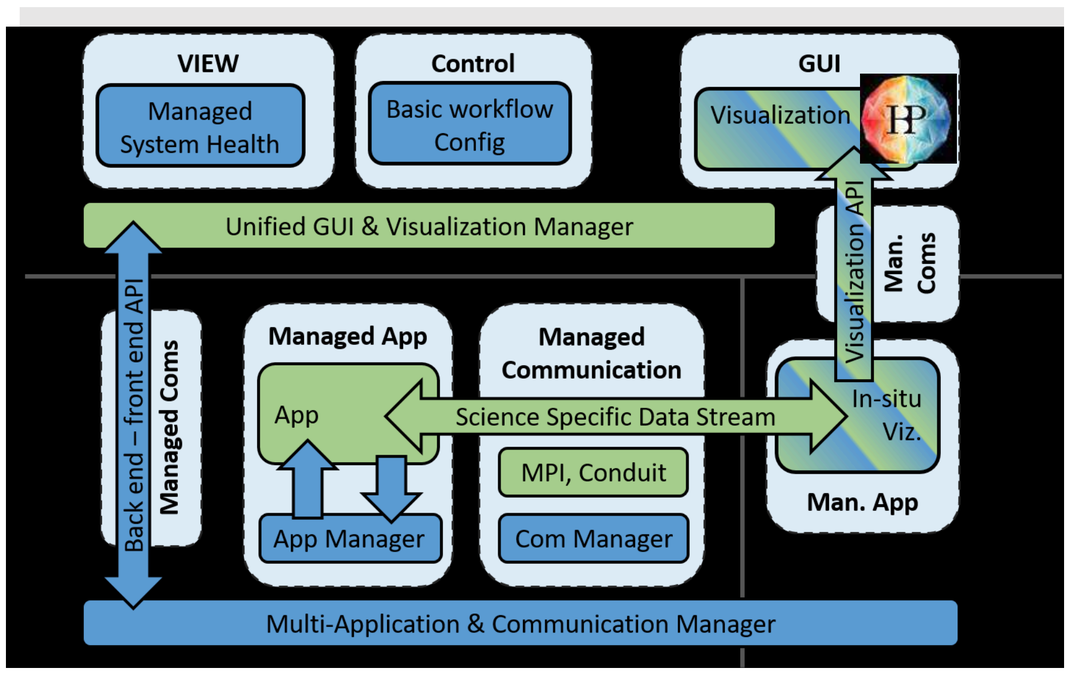


A planned framework for enabling integration, orchestration and intuitive & interactive control by domain scientists of:

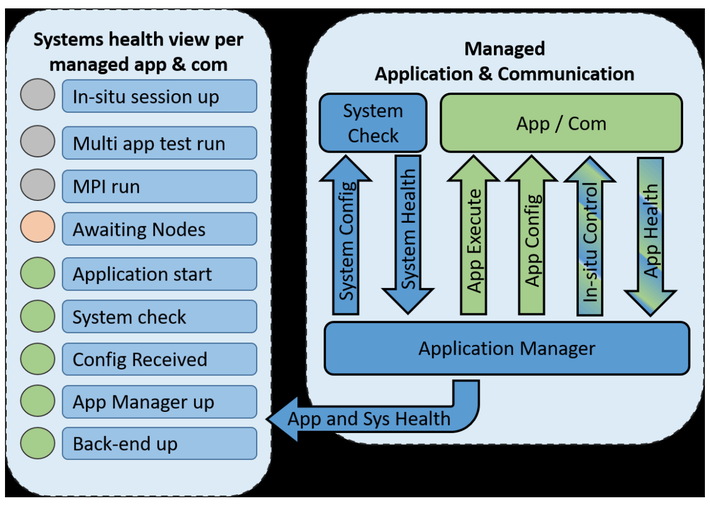
- online data sources
- applications executed on inhomogeneous HPC hardware
- special purpose hardware like neuromorphic accelerators

Planned System Architecture

- Managed applications and communication connected using a modular approach.
- Separation of system health information and science specific data-streams.
- Separation of concerns allows reasoning about isolated discrete steps in a processing pipeline.
- Integration of existing in-situ visualization and GUI solutions (HBP).

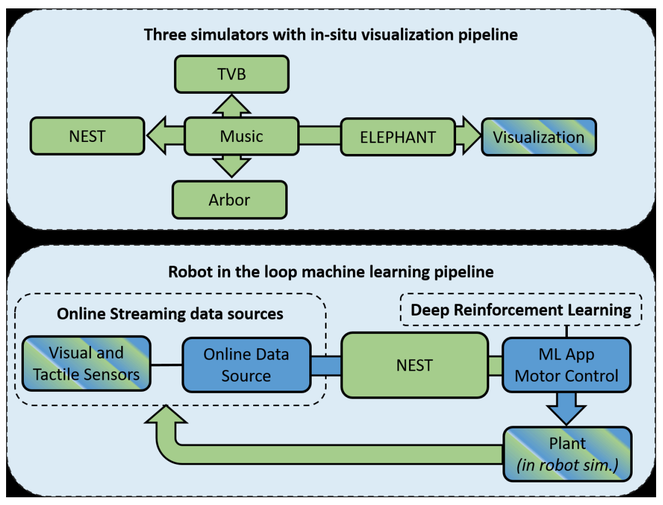


Scientist and Developer Interfaces



- System health information in a system monitoring tool built to support the domain scientist.
- Decomposition of HPC pipelines with well designed interaction contracts for developers makes interactions easier to reason about.

Use Case-Driven Design



- A multi-scale (NEST, Arbor/Neuron and TVB) simulation with online analysis (Elephant) feeding in-situ visualization communication.
- Real-world data sources coupled with online machine learning in the loop.

Further information

Neuron	https://www.neuron.yale.edu/neuron/
Elephant	http://elephant.readthedocs.io/en/latest/
NEST	http://nest-simulator.org/
TVB	https://www.thevirtualbrain.org
Arbor	http://arbor.readthedocs.io/en/latest/
Simlab	http://www.fz-juelich.de/ias/jsc/EN/Expertise/SimLab/slns/_node.html
CfADS	https://www.fh-bielefeld.de/ium/cfads
VR&IV	https://www.vr.rwth-aachen.de/
HBP	https://www.humanbrainproject.eu

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We are interested in possible use cases to drive design and implementation:

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