



PROGRAMME
DE RECHERCHE
NUMÉRIQUE
POUR L'EXASCALE

Brainstorming on application motifs

Analysis of relevant application motifs and their covering by the project illustrators

Location	Start	End time	Object	People in charge	Minute writer
La Reposée	08:00		Shuttle service from La Reposée to Inria		
Amphi G	09:00	09:30	Welcome coffee (within the space around the lecture hall)		
	09:30	09:45	Introduction to the parallel sessions	Julien Bigot	
Rooms: - Direction - Corsica - Belle-Ile	09:45	10:45	Preparation of the next deliverable, on application motifs (in parallel, by application)	Damien Gratadour for SKA Virginie Grandgirard for Gysela Laurent Colombet for other apps	Francieli & François & Jakob for WP1 - Dorian Midou for WP4-GYSELA
Near Amphi G	10:45	11:15	Coffee break (within the space around the lecture hall)		
Rooms: - Direction - Corsica - Belle-Ile	11:15	12:15	Preparation of the next deliverable, on application motifs (in parallell, by WP)	Francieli Boito & François Tessier for WP1 Yushan Wang & Laurent Colombet for WP2 Thomas Moreau & Bruno Raffin for WP3	Francieli & François & Jakob for WP1 Benoît for WP2
Near Amphi G	12:15	13:45	Lunch (standing buffet within the space around the lecture hall)		
Amphi G	13:45	14:15	Workshop feedback: WP1 (storage and I/O)	Francieli Boito & François Tessier	Francieli & François & Jakob
	14:15	14:45	Workshop feedback: WP2 (in situ processing)	Yushan Wang & Laurent Colombet	Benoît
	14:45	15:15	Workshop feedback: WP3 (ML-based analysis)	Thomas Moreau & Bruno Raffin	
	15:15	15:30	Conclusion	Gabriel Antoniu & Julien Bigot	
Room: Direction	15:30	16:30	Gysela/Damaris exchange (for those it concerns)	Gabriel Antoniu + Virginie Grandgirard	

What is an “application motif”

- This is the description of a use-case from applications
 - As specific as need be to clearly identify the problem (for real, no vague, general description)
- This a description of the problem tools & libraries we develop will solve
 - Irrelevant details can be removed (is the name of the application relevant to the use of our library?)

=> If you are used to agile methods, this is a “user story”: a **problem, not a solution**

- The application motif is the description of the problem our tools will solve for applications
 - It should be specific enough that if another application can relate to the motif, the tools and libraries we develop are useful for them to take on the shelf
- An application motif should make it possible to answer the question by another application:
 - “Your work on this application, is it relevant to me?”

For example

Large checkpoint motif:

“The writing of one large file (about 1/4 of the RAM) by one process per node, all nodes at the same time, every few hours of simulation, including as the very last step of the job. The data is a multi-D array, not necessarily contiguous in RAM (ghosts cells typically), but can be at the cost of writing a larger block of data. Only the latest write will be read and all previous writes can be disposed of as soon as a following write is securely written. The read happens with the same distribution as the writes and each process reads exactly what was written by a single specific process.”

- This example is inspired by Gysela and quite specific technically
- This can drive our work on IO optimization
- The Gysela name, the type of simulation that is not relevant to the checkpointing optimization has been removed

For example

Steering motif:

“A simulation is built by coupling two equally costly parts modeling two physical processes. One of the two parts is irrelevant at the beginning of the simulation (part A) and only becomes important when some specific conditions are met. A python script can be used to analyse the state of the simulation and give a probability of whether the part of the simulation should be started. The script requires access to two variables distributed over all processes and taking about 1% of the nodes RAM. The goal is to execute both the simulation and the script concurrently and to start part A in the simulation only when the probability it is required goes above 75%.”

- This motif is (freely) inspired by Coddex
- More information should be added to allow the design an in situ workflow
 - But description of the solution, the workflow is not part of the motif.

How we'll work

- First: identify specific problems in applications
 - 1 room for each of our 3 applications
- Members of WP 1-2-3 are distributed in the 3 rooms

Gysela

EXASCALE I/O

EXASCALE IN-

EXASCALE ML -

SKA

processing

analysis

Coddex & others

How we'll work

- After the coffee break: identify what we can do for each problem
 - 1 room for each of our 3 WPs 1-2-3
- Application developers are distributed in the 3 rooms

WP1:
Exascale I/O
and storage

WP2:
Exascale in-
situ data
processing

WP3:
Exascale ML-
based data
analytics

How we'll work

- This afternoon: each WP makes a quick presentation of what can be done for each motif
 - What are the relevant tools, approaches, tasks, etc.

WP1:
Exascale I/O
and storage

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WP2:
Exascale in-
situ data
processing

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WP3:
Exascale ML-
based data
analytics

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How we'll work

- You can set up a collaborative note taking system, but identify one lead note taker for each session!

Who goes where?:

- **Gysela (Direction):** Silvina Caino-Lores, Kevin Obrejan, Francieli Boito, Andres Bermeo Marinelli, Etienne NDAMLABIN, Virginie Grandgirard, Dorian Midou, Benoit Martin
- **SKA (Belle-Ile):** Shan Mignot, François Tessier, Sunrise Wang, Damien Gratadour, Jean-Francois NEZAN, Bruno RAFFIN, Damien CHAPON, Cédric Prigent
- **Coddex (Corsica):** Laurent Colombet, Gabriel Antoniu, Thomas Moreau, Jakob Luettgau, Julien Monniot, Yushan Wang, Abhishek PURANDARE
- **WP1 (Direction):** Francieli Boito , François Tessier , Shan Mignot , Julien Monniot , Dorian Midou , Etienne NDAMLABIN
- **WP2 (Corsica):** Laurent Colombet , Yushan Wang , Silvina Caino-Lores , Gabriel Antoniu , Benoit Martin , Kevin Obrejan , Damien CHAPON , Jakob Luettgau, Sunrise Wang
- **WP3 (Belle-Ile):** Thomas Moreau , Bruno RAFFIN , Andres Bermeo Marinelli , Abhishek PURANDARE , Thomas Badts , Damien Gratadour , Virginie Grandgirard , Cédric Prigent , Jean-Francois NEZAN