EXASCALE

# ExaMA

## Methods and Algorithms at ExaScale

Christophe Prud'homme & Hélène Barucq

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# Overview

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# Introduction

# Introduction

## ExaMA

NUMPEX/ExaMa concentrates on the exascale aspects of the numerical methods, ensuring their scalability to existing and forthcoming hardware.

Leaders: C Prud'homme & H Barucq

- 5 Work packages, may be spit even more
- wide range of topics:
  - Modeling and discretize
  - Linear, multi-linear and coupled solvers at Exascale
  - Combine data and models at Exascale
  - Optimize and quantify uncertainties at Exascale
- Demonstrators through mini-apps will be used to verify the properties of the methods and algorithms developed.

# Introduction

- 10 persons in initial work groups
- other teams consulted on various topics
- 7 Mio Euros budget

# Status, milestones and Budget

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## Status

- Build WP team
- try to get people from CEA,INRIA,CNRS and University
- try to have both men and women in the steering team
- 2/3 co-lead per WP in charge of specific topics
- Some WPs will be probably further split

| | |
|---|---|
| WP1 | S Lanteri, V Faucher C Prud'homme H Barucq |
| WP2 | L Grigori, L Giraud ... |
| WP3 | E Blayo, M Nodet, M Asch |
| WP4 | C Prieur, J Erhel, V Monbet, Y Privat, M Darbas, H Barucq |
| WP5 | CEA/DAM? C Prud'homme |

**Table 1:** WP

# Status, milestones and Budget

## Core Sites

**Table 2:** Core sites (to be discussed)

| CEA | University/CNRS | INRIA |
|---|---|---|
| CEA-DAM | Sorbonne Universités | Inria Paris |
| CEA-DES | Université de Strasbourg | Inria Bordeaux |
| CEA-DRF | Université de Pau/Toulouse | Inria Sofia |
| | Université Grenoble Alpes | Inria Lyon |
| | Université Paris Saclay | Inria Lille |

# Status, milestones and Budget

## Core Sites

Some issues/questions:

- potentially a lot of teams interested, find the right level
- any policies about leaders involvement and their team?

# Status, milestones and Budget

## Expected results

- Methods, algorithms, and implementations that, taking advantage of the exascale architectures, empower modeling, solving, assimilating model and data, optimizing and quantifying uncertainty, at levels that are unreachable at present.
- Software libraries allowing to assemble specific critical reusable components, hiding the hardware complexity and exposing only the specific methodological interface
- Methodological and Algorithmic Patterns at exascale that can be reused efficiently in large scale applications (eg in weather forecasting)
- Enabling AI algorithms to attain performances at exascale, exploiting the methods (point 1) and the libraries (point 2) developed.
- Demonstrators

# Status, milestones and Budget

## Milestones

- M1 Select IP-1 use-cases/demonstrators and associate methodology developments T0+6
- M2 benchmark IP-1 demonstrators on pre-exascale systems T0+9/T0+12
- M3 enable and benchmarks some new exascale IP-1 components on pre-exascale/exascale systems T0+18, T0+36, T0+54, T0+60

# Status, milestones and Budget

## Budget

- large project involved many teams
- need enough momemtum
- initially 7Mio Euro
- proposed budget 6Mio Euro
-

# Relations

# Relations

## Industry

### Contacted Entreprises

- EdF
- Safran

### To be contacted

- Arkema
- Total
- PlasticOmnium
- Atos
- Entreprises from Consortium Mordicus
- ...

# Relations

## PEPR

- IA
- Diadem ?
- TRACCS-Météo?

Links were made with CMA IA MAIAGE (training), results end of September.

# Relations

## Europe

- Coe Hidalgo-2
- ERC-Synergy EMC2
- EuroHPC Microcard
- H2020 RIA Digital Twin Bim2Twin
- CoE EoCoE-3
- EuroHPC European Master for HPC - EUMaster4HPC

# Relations

## Interactions with Genci and Tier-0

- TBD

# GitHub

# GitHub

## Project planning

- Create issues(tasks),
- break them into tasks,
- track relationships,
- add/use custom fields,
- and have conversations.

**Visualize large projects as spreadsheets or boards, and automate everything with code.**

# GitHub

## Table vs Board Views

- Built like a spreadsheet, project tables give a live workspace to filter, sort, and group issues and pull requests.
- We can tailor them to your needs with custom fields and saved views.
- boards can display group issues using custom fields (e.g. Status)

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# GitHub

## Break issues into actionable tasks

- Tackle complex issues with task lists
- track their status with new progress indicators.
- Convert tasks into their own issues
- navigate your work hierarchy.

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## Conversations

- Move conversations forward
- Express ideas with GitHub Flavored Markdown,
- mention contributors,
- react with emoji,
- clarify with attachments(videos, pdf, images...),
- see references from commits, pull requests, releases, and deploys.
- Coordinate by assigning contributors and teams,
- or by adding them to milestones and projects.

**All in a single timeline.**

# GitHub

## Create views

- Save views for sprints, backlogs, teams, or releases.
- Rank, group, sort, and filter issues to suit the occasion.
- Choose between tables, boards, and timelines.

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## Extend issues with custom fields

- Track metadata like iterations, priority, story points, dates, notes, and links.
- Add custom fields to project tables
- edit from the issue sidebar.

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| | Assignees | Labels | Cycles |
|---|---|---|---|
| 1 | pifafu | | |
| 2 | cookienomster | Bug | Cycle 1 |
| 3 | mariorod, moe, ar | Need help | Cycle 3 |
| 4 | lerebear | | |
| 5 | ajashams | Design | Cycle 4 |
| 6 | samoshin | Need help, Bug | Cycle 2 |
| 7 | kirkwayman | Need help | Cycle 1 |
| 8 | mdo | Need help | |
| 9 | keisaacson | | |
| 10 | berkelmas | Back-end, Bug | Cycle 1 |
| 11 | vilacides, trosage | | Cycle 4 |
| 12 | mariorod | Bug | |

# GitHub

## Extend issues with custom fields

- Track the health of your current iteration cycle, milestone, or any other custom field you create with new project insights.
- Identify bottlenecks and issues blocking the team from making progress with the burn up charts.

# GitHub

## Automate workflows

- Automate the project planning with workflows.
- Automatically triage issues, set values for custom fields, react to changes, or schedule something.
- You can even tee them up to run an Action.