../../figures/exascale.j

../../figures/math-hpc.jpeg

ExaMA

Methods and Algorithms at ExaScale

Christophe Prud'homme & Hélène Barucq

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Overview

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
- Initial Budget: 7 Mio Euros

Introduction

Identified Bottlenecks/Challenges

- (B1) Energy efficiency
- (B2) Interconnect Technology
- (B3) Memory technology
- (B4) Scalable systems software
- (B5) Programming systems
- (B6) Data Management
- (B7) Exascale Algorithms
- (B8) Discovery, design, and decision algorithms
- (B9) Resilience, robustness and accuracy
- (B10) Scientific productivity
- (B11) Reproducibility, replicability of computation
- (B12) Pre/Post-processing
- (B13) Integrate Uncertainties

Status, milestones and Budget

Status, milestones and Budget

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Status

- Currently building 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, Cambodo? V Monbet, Y Privat, M Darbas, H Barucq
WP5	CEA/DAM? C Prud'homme

Table 1: WP team

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

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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

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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

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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

Training

- Communication with Masters and Doctoral Schools about Numpex/ExaMa
- Do it as early as possible to ensure that eg Master track to include HPC courses inline with ExaMA
- EuroHPC European Master for HPC - EUMaster4HPC
- Other aspects: Develop training material for ExaMA

Relations

Interactions with Genci and Tier-0

- TBD

GitHub

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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.

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Table vs Board Views

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- 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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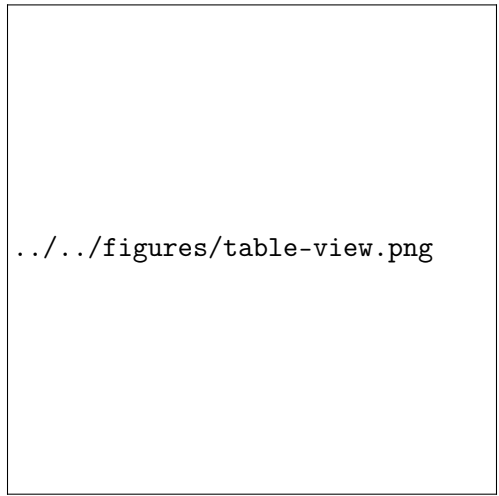

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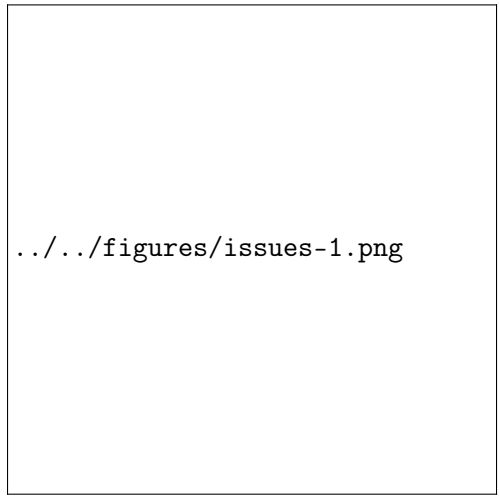
Break issues into actionable tasks

- 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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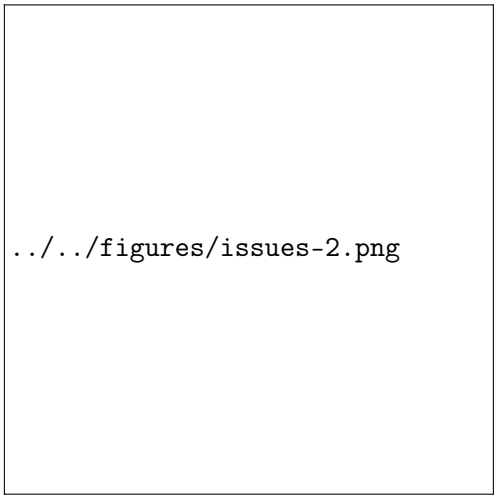

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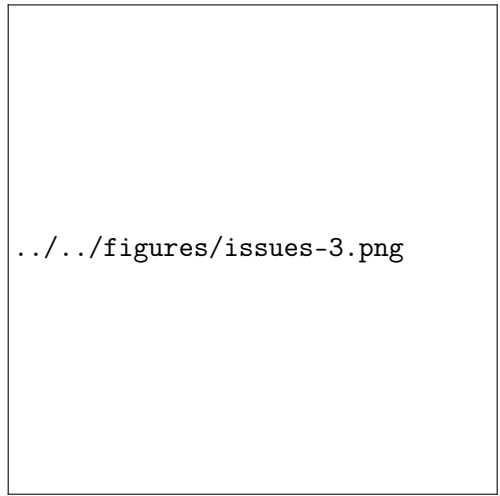

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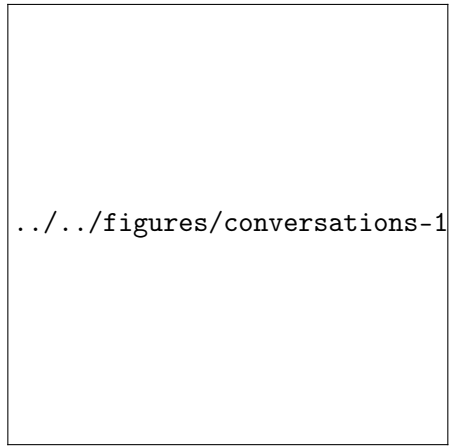
Conversations

- 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.



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Create views

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- 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

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- 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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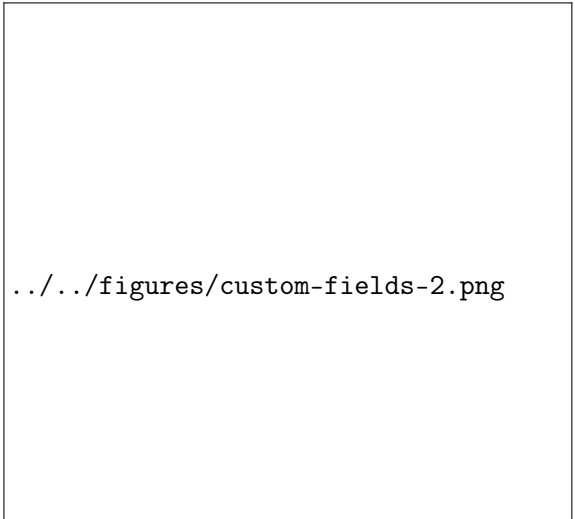

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Extend issues with custom fields

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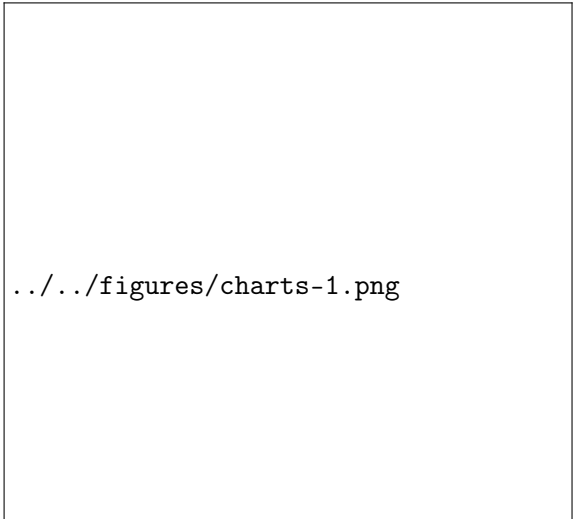
- Track the health of your current iteration cycle, milestone, or any other custom field you create with new project insights.
- Identify bottlenecks and issues blocking the team from making progress with the burn up charts.



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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.