

3/27/17

<Title>
MIMICA code analysis

Project plan

< *The purpose of the project plan is to identify, define and delimit the project's commitment.* >

< WHO IS INVOLVED IN THE PROJECT >

1. Project organization

Requester

Name: Annica Ekman

Title/position: Professor

Affiliation: MISU, Stockholm University

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Project responsible for requester (if different from requester)

Name: Matthias Braksbusch

Title/position: Scientific Programmer

Affiliation: Department of Environmental Science and Analytic Chemistry, Stockholm University

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Project responsible for SNIC

Name: Wei Zhang

Title/position: Application expert

Affiliation: NSC, SNIC

Phone:

E-mail: weizhang@nsc.liu.se

< For other project members, please specify role and contact details. >

Project member

Name: Hamish Struthers

Title/position: Application expert

Affiliation: NSC, SNIC

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E-mail: struthers@nsc.liu.se

Project manager

Name: Torben Rasmussen

Title/position: Application expert

Affiliation: NSC, SNIC

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2. SNIC project name

< Name of an associated SNIC resource allocation project, if applicable (e.g. SNIC 2014/X-YYY). >

< MOTIVATION FOR GETTING THIS PROJECT SUPPORT >

3. Expected enabling benefit

< Generally provided by the requester. Formulate the expected enabling benefit. That is, the benefit the project will contribute to associated research activities on short and/or long term. How will this further enable research activities for the requester and others? >

Short-term benefit:

- Better understand the communication pattern and learn about performance optimization potential for the MIMICA model.
- Set of recommendations regarding focus points for code optimization changes.

Long-term benefit:

A speedup of this code will enable researchers to perform more and/or longer simulations within a range of scientific projects. A necessary first step in optimizing the internal communication within model is an analysis of the code.

4. Impact of the research that the project is associated with

< Generally provided by the requester. Why is this enabling important? For example, describe how important the software/data is for your current and future research activity and for other national and international research activities. >

The MISU MIT Cloud and Aerosol (MIMICA) LES model is a unique tool for understanding cloud formation on a detailed scale and the sensitivity of cloud microphysical and radiative properties to changes in environmental parameters such as aerosol particle concentrations. In contrast to larger-scale models, the simulation time and spatial scale of MIMICA is suitable for direct comparison with in-situ measurements.

LES that includes interactive atmospheric chemistry and microphysics is computationally intensive and so it is important to try to gain the best performance possible from the code. This will enable more and/or enable longer simulations to be run and completion times to be reduced - freeing time for scientific analysis of the output.

5. Why is SNIC assistance needed?

The proposed project is a technical analysis of the MIMICA model and therefore outside the scope of atmospheric modeling scientific research. SNIC application experts have experience with the analysis of complex models such as MIMICA and therefore such work is more efficiently performed by SNIC AEs.

< WHAT ARE WE HANDS-ON GOING TO DO IN THE PROJECT? AND HOW? >

6. Project objective

< Describe briefly the background and formulate the project objective, i.e. what is it intended that the project should do to achieve the expected enabling benefit? How are you going to deliver the requested enabling? >

The project aims to understand the internal communication pattern and performance of the MIMICA LES code.

We will:

- Review the relevant MPI subroutines and internal communication strategy within MIMICA.
- Analyze the MIMICA code to identify code sections and routines to be further evaluated for performance optimization. We will do this by running suitable test cases through analysis tools such as Allinea Forge.
- Propose a set of recommendations for code changes/optimization based on the code analysis.

Deliverables:

Delivery no.	Description	Schedule
1	Presentation of code profiling analysis.	April 2017
2	Report detailing recommendations for source code revisions for model runtime optimization.	April 2017

7. Work plan and resource estimate

< Specify the required staff resources in PM and the time frame for the project. >

The project will be conducted during 2017-H1. NSC will spend up to 1 PM within this project.

Person months will mostly be carried by the 'National Användarstöd' project.

Start date: January 2017

End date: 2017-04-30

Defined milestones (MS) and decision points (DP):

< Describe important review points in the form of milestones and decision points. >

Milestone/Decision point	Description	Date
DP1	Project plan approved	December 2017
MS1	Initial face-2-face meeting	January 2017
MS2	Analysis/profiling completed	March 2017
MS3	Report detailing profiling results and recommendations. Discussion of potential follow-on project on implementation of recommendations.	April 2017

Responsibilities:

< Describe the responsibilities of the various project members and stakeholders. Who is responsible for what? And who decides what? >

- SU will provide access to the MIMICA code and documentation.
- When necessary, SU will provide assistance for SNIC to understand the code.
- SU will provide test cases for the code profiling/analysis.
- NSC/SNIC will perform the code analysis/profiling and prepare a report of proposed code changes.
- All project members will discuss what code changes may be relevant for implementation. NSC/SNIC will organize a face-2-face meeting to go through the project report and discuss possible followup project on implementation of code changes.

Communication and dialogue:

< Describe how the project members will keep each other updated throughout the project. Describe how results, decisions, project changes, etc. will be discussed and communicated. >

- Initial face-2-face meeting in Stockholm, to coincide with regular MIMICA group meeting/training.

- E-mail contact to set up access to the code and provide test cases for the code profiling.
- E-mail, phone, skype contact as necessary throughout the project.
- Face-2-face meeting in Stockholm to present project report, discuss future implementation of recommendations and close the project.

Confidentiality requirements:

N/A

8. Approval

< The signatures of all parties confirm the validity of the project plan. The SNIC office can overrule this approval or require adjustments to the project plan, such as the amount of PMs that can be spent in the project. >

I agree to the objective, scope, and responsibilities described in this project plan:

Requester**For SNIC**

Date:

Date:

Annica Ekman

Matts Karlsson

Project responsible for SNIC

Date:

Wei Zhang