Page 1: Please provide the information requested below....

Q1 What is your organisation's/project's name?

NLAFET – Parallel Numerical Linear Algebra for Future Extreme Scale Systems

Q2 Your organisation's/project's website

www.nlafet.eu

Q3 Are you? **A project**

Q4 Your name

Bo Kågström, NLAFET Main Coordinator; Lennart Edblom, NLAFET Administrative Coordinator

Q7 Please summarise who you are and what you do

Today's largest HPC systems have a serious gap between the peak capabilities of the hardware and the performance realized by high-performance computing applications. NLAFET is a direct response to the demand for new mathematical and algorithmic approaches that will make it possible to use the peak capabilities of today's and future extreme-scale computing systems.

NLAFET enables a radical improvement in the performance and scalability of a wide range of real-world applications relying on linear algebra software, by developing novel architecture-aware algorithms and software libraries, and the supporting runtime capabilities to achieve scalable performance and resilience on heterogeneous architectures.

The main research objectives are: (i) development of novel algorithms that expose as much parallelism as possible, exploit heterogeneity, avoid communication bottlenecks, respond to escalating fault rates, and help meet emerging power constraints; (ii) exploration of advanced scheduling strategies and runtime systems focusing on the extreme scale and strong scalability in multi/many-core and hybrid environments; (iii) design and evaluation of novel strategies and software support for both offline and online auto-tuning.

The main impact will be to develop, deploy and make software available to the scientific community and industry by providing novel tools for their computational challenges.

Q8 In what way would like to contribute to an EsD project?

As a technology provider

Q9 What would be your contribution to an EsD project?

Open-source library software modules for solving problems in computational science.

Numerical linear algebra is both fundamental and ubiquitous in computational science and its vast application areas. This means that the results of NLAFET will have applicability to computational science in general. Many of the methodologies, functionalities and solutions developed within NLAFET will also be applicable to the development of numerical solutions for a wide range of applications. The software is validated by integrating it into scientific applications in materials science, power systems, study of energy solutions and data analysis in astrophysics.

Q10 What partners are you looking for?

Application providers, software and hardware vendors. In general, NLAFET wants to join forces with a consortium that can use our software by integrating in into challenging Exascale applications. We will of course provide expertise in tailoring the software and integrating it into large applications and systems.

Q11 Please include links to any additional material.

NLAFET general web page: http://www.nlafet.eu/
NLAFET publications: http://www.nlafet.eu/publications/
NLAFET software: https://github.com/NLAFET/

Q12 Other comments/ideas

Currently, many of the deliverables developed in the NLAFET project include parallel algorithms and prototype software for dense and sparse linear systems and eigenvalue problem solvers. Some of these will be further developed and new software modules will be developed within the project and made publically available on the NLAFET github. In addition, more emphasis will be put on heterogeneous systems including accelerator hardware and large-scale architectures.

For more info about the industrial applications that are currently used for validation in the NLAFET project, please contact Laura Grigori, INRIA, laura.grigori@inria.fr, or Iain Duff, STFC, iain.duff@stfc.ac.uk, or Jack Dongarra, University of Manchester, dongarra@icl.utk.edu