



SHAPE Helping SMEs to get started with HPC

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SHAPE
SME HPC Adoption Programme in Europe



SHAPE Talk overview

- ▶ What is the **SHAPE** Programme?
- ▶ Why does **SHAPE** focus on SMEs?
- ▶ How can SMEs benefit from **SHAPE**?
- ▶ Why don't SMEs already try **HPC**?
- ▶ What do we mean by **HPC**?
- ▶ How can SMEs apply to the **SHAPE** programme?
- ▶ What do SMEs get from a **SHAPE** project?
- ▶ What is a typical **SHAPE** project?
- ▶ What do SMEs think of **SHAPE**?
- ▶ What do we plan to do with **SHAPE** in the future?



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What is the **SHAPE** Programme?

- ▶ SHAPE: **SME HPC Adoption Programme** in **Europe**
- ▶ Launched as a Pilot call in 2013
 - ▶ Presently run via a series of open calls at 6-monthly intervals
 - ▶ Just run 12th call!
- ▶ SHAPE Co-ordinator: Chris Johnson at EPCC
- ▶ Run as a task within the PRACE 6th Implementation Phase
 - ▶ alongside other calls (DECI and Preparatory Access)



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Why does **SHAPE** focus on SMEs?

- ▶ SHAPE is focussed on SMEs
- ▶ SMEs are the backbone of the European Economy
 - ▶ **99/100** businesses are SMEs
 - ▶ In 2018, just over 25 million SMEs generated **€4.4 trillion** in value added and employed around **98 million** people (EC SME Performance Review 2018/2019)
- ▶ How many can realistically benefit from HPC?
 - ▶ In 2008 a study in Scotland found around 1,400 companies *could* use HPC, with 300 of these *likely* to
 - ▶ Scaling across Europe indicates around 142,000 potential SME HPC users and **30,000**

that are likely to





How can SMEs benefit from **SHAPE**?

- ▶ Programme aims to **raise awareness** and **assist** SMEs in taking advantage of HPC
 - ▶ aimed primarily at HPC “first-timers”
- ▶ Enable development of **new products**
- ▶ **Reduce** time-to-market and R&D **costs**
- ▶ **Increase quality** of services and products
- ▶ Reduce manufacturing costs
- ▶ **Innovation**
- ▶ We are seeing a merging of HPC and “Big Data”
 - ▶ Great **opportunities** for HPC in new sectors



Why don't SMEs already try HPC?

- ▶ There are many barriers for SMEs attempting the use of HPC.
- ▶ Cost of operation
 - ▶ A first project can easily cost €60K-100K
 - ▶ This is a lot of money for an SME
- ▶ Lack of expertise
 - ▶ No in-house experience
 - ▶ Cost of consultancy
- ▶ Lack of resources
 - ▶ No access to appropriate hardware
- ▶ Risk!
 - ▶ If never used HPC before, high risk, but ... potentially high benefit





What do we mean by HPC?

- ▶ It's not just about parallelising code and petaflops!
- ▶ To SMEs, HPC can mean many things
 - ▶ GPU acceleration
 - ▶ Going from serial to parallel (10s of cores)
 - ▶ Optimisations (algorithmic)
 - ▶ Data (analysis, volume)
 - ▶ Tool chain
 - ▶ Service provision
- ▶ All can have a profound impact on the way the SME does business





How can SMEs apply to the **SHAPE** programme?

- ▶ Simple application form (not all sections compulsory)
- ▶ Prior detailed knowledge of HPC not required
- ▶ **Advice available** from PRACE centres at this stage

- ▶ Regular calls for applications, which are judged on
 - ▶ **Strength of business case**
 - ▶ **Achievability, commitment** from the SME and **innovation**
 - ▶ Social and economic **impact** for society



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What do SMEs get from a **SHAPE** project?

- ▶ Successful applicants get
 - ▶ **Help** from a PRACE centre expert (typically 2-6 months)
 - ▶ **Machine time** on a PRACE machine
- ▶ In return, the SME
 - ▶ Supplies domain expertise and in-kind effort to work with the PRACE expert
 - ▶ Produces a short technical paper, publicity, feedback etc
 - ▶ Reports on business improvements (ROI) a year on from project



What is a typical **SHAPE** project?

- ▶ To date, **71 SMEs** have been or in process of being helped



Engineering Solutions and Innovations



JUAN YACHT DESIGN
Juan Kouyoumdjian · Naval architecture



Offshore Monitoring

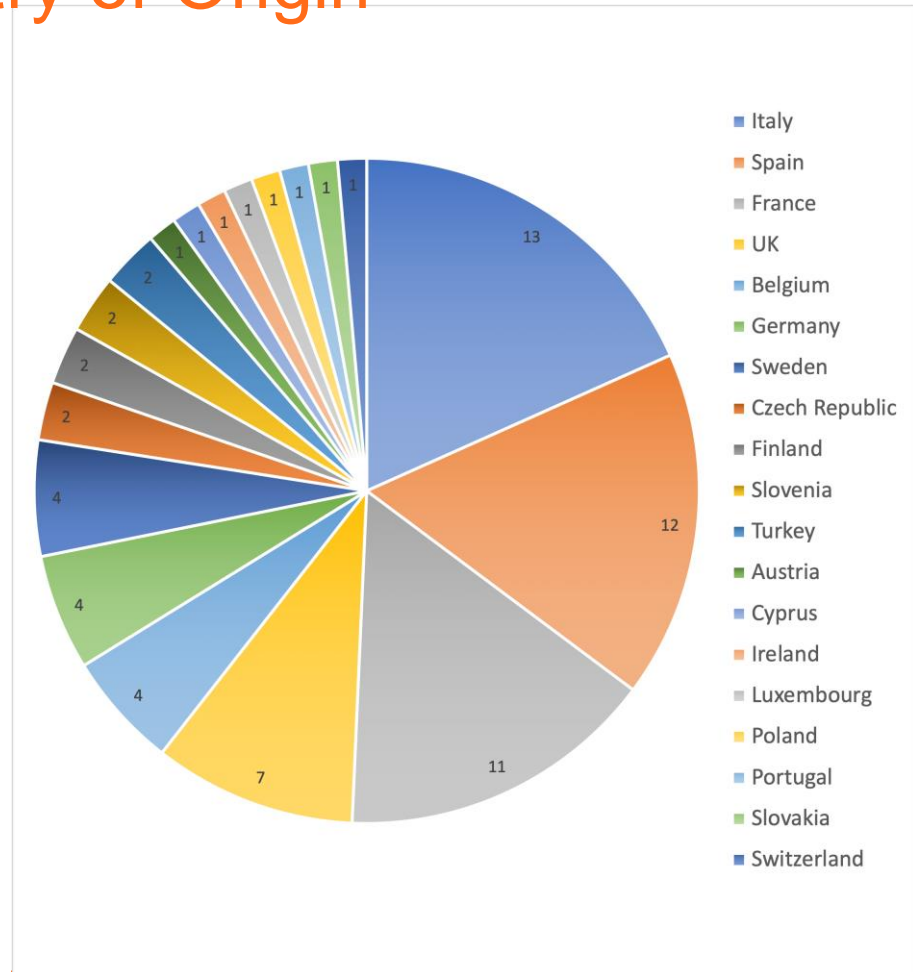


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SHAPE SME Country of Origin

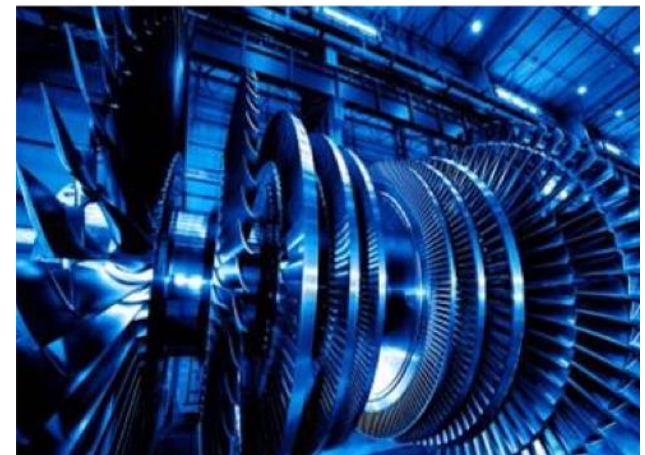


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EPCC: Renuda UK / Optimising 2D flow for faster, better steam turbine design

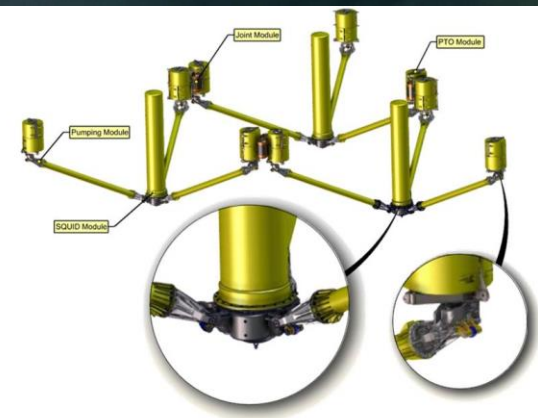
- ▶ Renuda UK Ltd is an independent company offering software development, consultancy, training and support, specialising in Computational Fluid Dynamics
- ▶ Goal: to improve the performance of Renuda's industrial steam turbine modelling code, CodeX
- ▶ Expected business impact
 - ▶ Allow clients to perform previously prohibitively expensive/complex simulations
 - ▶ Opening up new market opportunities



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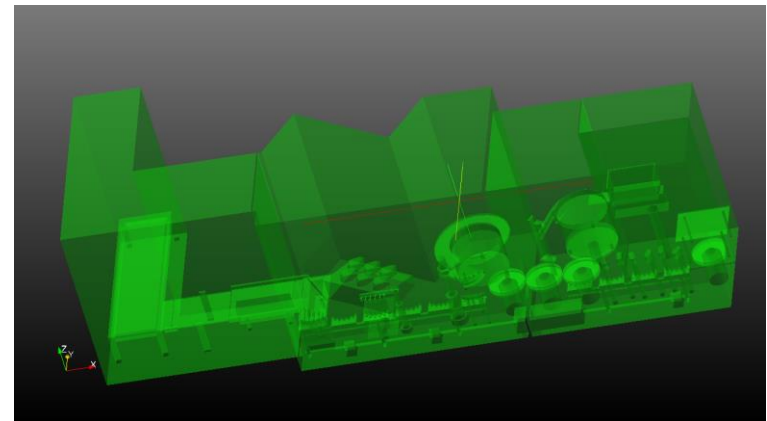
SHAPE success stories

- ▶ AlbaTERN: modelling of innovative wave power generation devices
 - ▶ Gained expertise to expand their simulation capability to large km-wide device arrays



SHAPE success stories

- ▶ Optima PHARMA: airflow simulations
 - ▶ Used OpenFOAM to simulate airflow in “clean rooms” used in various industries, particularly for pharmaceutical products
- ▶ More at <http://www.prace-ri.eu/hpc-access/shape-programme>





SHAPE success stories

- ▶ Invent Medical Group
 - ▶ An SME that creates cranial orthoses (head supports) via 3D-printing
 - ▶ Designs need testing - can be done in a laboratory, but simulation is more efficient.
 - ▶ SME tried out standard open source HPC package ESPRESO and compared it to well-established commercial package ANSYS they were already using
- ▶ More at <http://www.prace-ri.eu/hpc-access/shape-programme>





What do SMEs think of **SHAPE**?

- ▶ Follow-up with SMEs post project
 - ▶ 2 surveys (SME and PRACE Partner)
- ▶ We asked about the following metrics
 - ▶ New customer acquisition
 - ▶ Turnover
 - ▶ Return on Investment (RoI)
 - ▶ New product offers
 - ▶ New service offers
 - ▶ Access to new markets
 - ▶ Enhanced software features
 - ▶ Staff recruitment
- ▶ Intangible measures
 - ▶ Optimism that improved service/software solution will lead to an increase in customers
 - ▶ R & D accelerated





SHAPE Survey Results

- ▶ 14 SMEs surveyed with projects that finished ~1 year ago: All responded!
- ▶ Notable points from survey
 - ▶ 10 SMEs continue to use HPC after SHAPE
 - ▶ *6 are using Cloud-based systems*
 - ▶ *3 are using their own HPC systems*
 - ▶ *1 is using HPC resources from an HPC centre*
 - ▶ 11 SMEs report that they now have more staff with HPC skills than previously
 - ▶ *typical rises of around 1-2 employees.*
 - ▶ A number of impressive code performance improvements shown
 - ▶ clear improvements in the business process, particularly a faster time to market and increased sales
- ▶ Results all summarised in D7.2 deliverable – available soon - see public deliverables





SHAPE Future plans

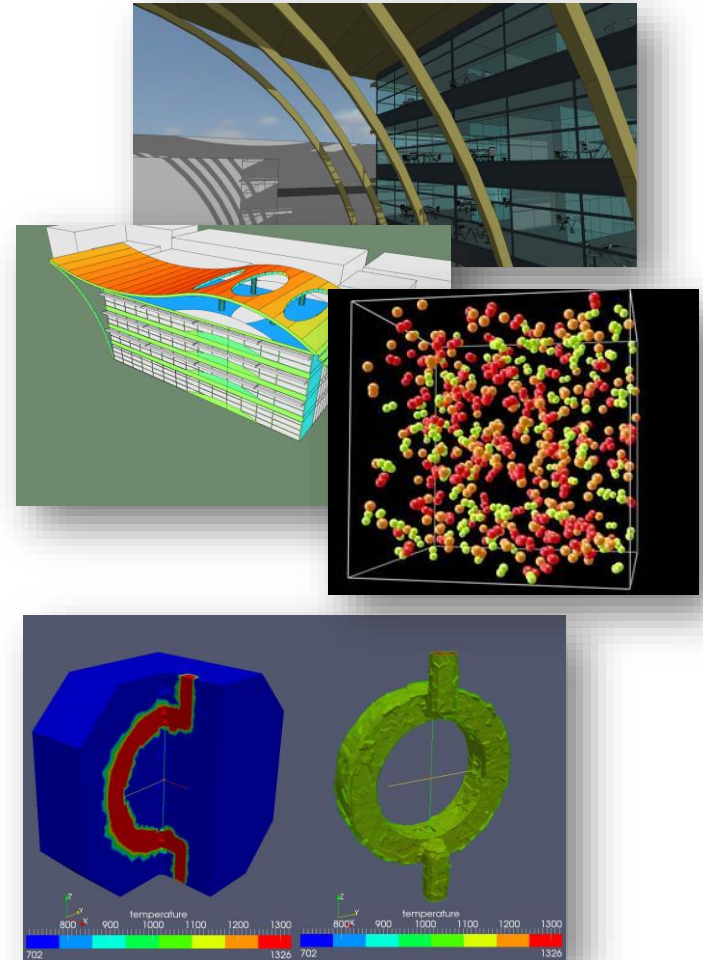
- ▶ Presently looking how SHAPE may continue in the EuroHPC era
- ▶ Challenges to be tackled
 - ▶ Increasing number of proposal
 - ▶ Increasing number of countries represented
 - ▶ Both have improved recently but would like to keep this up
- ▶ We are assessing ways in which we can improve the application process
 - ▶ Improvement to the application form
 - ▶ Possible increased frequency of calls





SHAPE Conclusion

- ▶ SMEs are **key** to a thriving economy
- ▶ Many SMEs would benefit from using HPC
 - ▶ Reduction in costs, time to market, etc
 - ▶ ... but, there are barriers to this
 - ▶ Initial cost, risk, access to resources...
- ▶ **SHAPE** helps SMEs to overcome these barriers
 - ▶ Delivers tangible benefits to their business



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Thanks - questions

- ▶ SHAPE: <https://prace-ri.eu/prace-for-industry/shape-access-for-smes/>
- ▶ SHAPE co-ordinator: Chris Johnson c.johnson@epcc.ed.ac.uk

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