Research Software Engineer Knowledge Integration Landscape Review

The Research Software Engineer (RSE) Knowledge Integration Landscape Review was commissioned by the ExCALIBUR (**Ex**ascale **C**omputing **AL**gorithms & **I**nfrastructures **B**enefitting **U**K **R**esearch) programme to provide a comprehensive Landscape Review focussed on the concept of the Research Software Engineer and their role within UK Science in preparation for the arrival of Exascale Supercomputers.

The document written by members of the ExCALIBUR Programme community details:

- The skills required by RSEs in HPC
- The future training needs of RSEs
- Challenges faced in developing these skills and growing the number of RSEs in the UK with a specific focus on HPC
- The importance of establishing a career path for RSEs that does not rely on the conventional academic metrics.

ExCALIBUR is an exciting UK programme funded through the UK Government's Strategic Priorities Fund. This is a 5-year, £46m programme of activities led by the Met Office and UKRI.

The vital role of RSEs in the UK computational science community has grown markedly over the last decade.The need for Research Software Engineers focussed on HPC is wide ranging; from cosmology to digital archiving, HPC is used at all scales of scientific discovery. Indeed, with the field of HPC undergoing an explosion in technologies and becoming a cornerstone of research in many diverse fields, the need for RSEs with HPC experience will continue to grow.

The ExCALIBUR Research Software Engineer Knowledge Integration Landscape Review (DOI:10.5281/zenodo.4986062) can be found at https://zenodo.org/communities/excalibur-spf

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The report delivered the following recommendations on the future training and skills requirements for RSEs, identified a number of training and skills gaps in the current provision and discussed the issues surrounding the long-term career development of RSEs:

- UKRI should continue to invest in the development of Research Software Engineering in the UK.
- As we grow the overall number of RSE staff in Universities, National Laboratories, and other research organisations we should also grow the number of such staff with specific High-Performance Computing skills.
- An ExCALIBUR Training Programme for Research Software Engineers who want to focus on High Performance Computing should be established.
- A long-term training strategy should be developed to both train the next generation of RSEs with HPC skills and also fill the training and skills gaps identified in this report.
- A variety of different training models should be adopted – including postgraduate study, workshops, hackathons and bootcamps. Wherever possible training should be made available as online training as well as in face-to-face training opportunities.
- Clear career paths for Research Software Engineers, and funding opportunities for software development allowing them to apply and develop skills, are crucially important to ensure that, once trained, the knowledge they have gained stays in the research sector and grows over time. The contribution of software engineering needs to be recognised in university recruitment and promotion procedures.

> “Investment in software means investment in people.”

- UKRI should ensure that it supports the message that Research Software Engineers are a highly valued resource at Universities, National Laboratories, and other research organisations by providing clear guidance for inclusion of RSEs on grants.
- Greater collaboration and transfer of skills by RSEs in both directions between the academic and industrial research sectors should be encouraged, particularly from industry to academia.
- The UKRI Exascale Supercomputer Project’s software programme should ensure that it encompasses a variety of different types of software activity and ensure they are contributing to developing the RSE community with HPC skills in the UK.