

## SOFTWARE AS AN INFRASTRUCTURE

### Action Plan

EPSRC have developed and published the [Software as an Infrastructure strategy](#) which has been developed following extensive input from the UK community. This is the associated Action Plan which sets out the activities that will be pursued as a consequence of the strategy that has been developed. Some of these will be pursued immediately; others are longer term and will be further developed based on the outcome of other activities and input from stakeholders.

### Strategic goals

The activities described below are linked to the strategic goals that were highlighted in the Software as an Infrastructure strategy. These are described below.

#### Shaping Capability

This links to one of EPSRC [strategic goals](#) and addresses the need to build the capability to deliver high quality and important research through the development of sustainable and robust software. It is split into three strands:

- *Identification of new areas and grand challenges*
- *Enabling and promoting collaboration*
- *Research and development*

#### Developing Leaders and skilled people

This links to one of EPSRC [strategic goals](#) and aims to ensure the building of the software correctly by building on current expertise, supporting the careers of researchers (including developers) in this domain, providing training, and actively encouraging collaborative working and inter-disciplinarity. There are two strands to this strategic goal:

- *Training*
- *Career Path Support*

#### Delivering Impact

This links to one of EPSRC [strategic goals](#) and aims to maximise the academic, societal and economic impact of current and future investments in software by providing appropriate user support, developing business models and promoting collaboration with industrial and international partners. There are three strands within this area:

- *Joint funding models*
- *Supporting innovation*
- *User support*

#### Ensuring Trust

This aims to ensure that developers and users can trust in a robust and reliable software infrastructure by providing support for verification, testing and use and consists of two strands:

- *Quality of code*
- *Sustainability of code*

## **Planning for the Future**

This aims to develop a longer-term strategy and sustainable funding streams for software support.

### **Structure of the Action Plan**

Two tables are presented. One of these describes actions that will be undertaken before April 2012. Many of these are already in progress. The second table looks at future actions. Many of these will be implemented by April 2013. However some will deliver over longer time scales. Finally, at the end of the document there is a list of aspirations which EPSRC will be working towards achieving over the next five years, both through the activities described below and as yet undefined activities, to develop software as an infrastructure.

## Software as an Infrastructure Action Plan

### Early actions (before April 2012)

Planned activity	Description	Strategic Goals met
<b>CCP Widening Participation Call</b>	This call offers a small amount of additional funding to existing <a href="#">EPSRC-funded CCPs (Collaborative Computational Projects)</a> to build inter-CCP links, and for outreach to new communities. The call was released on 23 <sup>rd</sup> January 2012.	Shaping Capability: Enabling and promoting collaboration  Shaping Capability: Research and Development  Delivering Impact: Joint funding models
<a href="#">Additional dCSE support</a>	Additional funding is being made available for dCSE support for both HECToR and for university and regional clusters. The distribution of support for university and regional clusters will be managed by NAG on a competitive basis and will be operated as a pilot in the first instance.	Shaping Capability: Research and Development  Delivering Impact: User support
<a href="#">Fellowship support</a>	Fellowships will provide appropriate long-term support mechanisms for researchers. Fellowships in software development are being offered through the Engineering and Physical Sciences areas. These must be both novel in the approach to software development and the Engineering or Physical Sciences areas.	Developing leaders and skilled people: Career path
<a href="#">Future ICT-enabled manufacturing call</a>	EPSRC's Future ICT-enabled manufacturing call has been aligned with EPSRC's Software Strategy and applicants will be encouraged to consider software sustainability as part of their proposals.	Ensuring Trust: Quality of code  Ensuring Trust: Sustainability of code
<b>Relationship Building</b>	EPSRC will aim to build stronger links with existing software activities such as the <a href="#">Crossing the Chasm Network</a> and the <a href="#">Science and Innovation award (NAIS)</a> to determine progress of these activities against the original objectives . In addition, EPSRC will continue to build relationships with key industrial users of HPC and to consider routes where joint activities can be undertaken.	Shaping Capability: Enabling and promoting collaboration  Delivering Impact: Joint funding models

## Future actions

Planned activity	Description	Strategic Goals met
<a href="#">EPSRC/NSF joint funding activities</a>	Networking activities with US researchers have already been jointly funded by EPSRC and NSF. EPSRC have earmarked up to £3M to put into the next stage of this call which will fund researchers to develop software with their US counterparts. EPSRC are currently finalising the details of the call and it is hoped that it will be released in spring 2012.	Shaping Capability: Enabling and promoting collaboration
<b>Software for the future</b>	<p>A process to fund a small number of large, multidisciplinary activities is planned for the spring of 2012. This is likely to be targeted at:</p> <ul style="list-style-type: none"> <li>• Focussing on future challenges for software arising from new architectures</li> <li>• Developing and re-engineering key existing code for new architectures</li> <li>• Developing novel code in key application areas</li> <li>• Developing new coding platforms for current and future architectures</li> </ul> <p>It is hoped that, though led by EPSRC's Infrastructure Theme, there will also be input from the ICT and Maths Themes.</p>	<p>Shaping Capability: Enabling and promoting collaboration</p> <p>Shaping Capability: Research and development</p>
<b>Software at facilities</b>	EPSRC will work with colleagues at facilities to explore their existing and future support for software infrastructure.	Shaping Capability: Enabling and promoting collaboration
<a href="#">HPC Software Development Call Stage Gate</a>	The outcome of stage 2 of the 2011 HPC Software Development proposals is due in April 2013. Decisions on whether the projects will progress to stage 2 will be made following a process that will be shared with grant holders in early 2013.	Shaping Capability: Research and development
<b>Review of dCSE support at university level</b>	The pilot dCSE call for university and regional clusters will be reviewed and further investment may be awarded depending on the outcome of the review.	<p>Shaping Capability: Research and development</p> <p>Delivering Impact: User support:</p>

<b>Training and skills development for students and researchers</b>	EPSRC will work with existing activities such as the <a href="#">Software Sustainability Institute (SSI)</a> , the <a href="#">HPC Short Course Centre</a> and <a href="#">Centres for Doctoral Training (CDTs)</a> to provide more mechanisms for training and support in software development at an early stage in researchers' careers.	Developing Leaders and Skilled People: Training  Developing Leaders and Skilled People: Career path
<b>Fellowship support</b>	Depending on success of the fellowship activities already underway and described above, the scope of the scheme may be widened or the process adapted.	Developing Leaders and Skilled People: Career path
<b>Industrial engagement</b>	EPSRC are currently working with a selected number of partners to understand their needs for developing software in the short term. The understanding gained from these discussions, along with further engagement with academic and industrial stakeholders, will determine activities to undertake in the future.	Delivering Impact: Joint funding models  Ensuring Trust: Sustainability of code
<b>Influencing EPSRC Managed Calls</b>	Building on the experience gained from the Manufacturing Informatics Call described above, EPSRC's Infrastructure Theme plan to develop peer review models that allow the assessment of the science case and the software development component as key components of the proposals for appropriate managed calls.	Ensuring Trust: Quality of code
<b>Embedding sustainable code development</b>	EPSRC plan to provide support for professional software developers to be involved in research projects from an early stage.  Work will also be done by EPSRC to understand and characterise trends in hardware development to allow the community and EPSRC to plan future investments required to provide a robust and reliable software infrastructure.  Researchers will be encouraged to use Open Source solutions.	Ensuring Trust: Sustainability of code

<p><b>Good Practice</b></p>	<p>Some exemplars of good practice were submitted as part of the community engagement following the Software workshop held in October 2011. These examples are both for UK and international activities. EPSRC will commission a report on the benefits to institutions of a career path for sustainable software developers, which will include a number of UK and international case studies. This will be disseminated to Universities.</p>	<p>Developing Leaders and Skilled People: Career path support</p>
<p><a href="#"><u>Research Outcomes System (ROS)</u></a></p>	<p>There is a place to capture software in the new ROS system, which will record information such as 'Place of Publication'. EPSRC will develop specific guidance for what should be included in the free text fields of this system in terms of reporting on software which will allow information to be captured consistently and allow EPSRC to track where the software that we support is used.</p>	<p>Ensuring Trust: Sustainability of code</p>
<p><b>Community engagement</b></p>	<p>EPSRC's Infrastructure Theme will work with other EPSRC Themes and the community to understand existing research needs and identify exemplars of computationally enabled grand challenges, linking with the EPSRC Shaping Capability activity.</p> <p>Longer term, working with other Research Councils, institutions and the industrial and academic community, EPSRC will identify new research areas and user communities and broker relationships with nascent communities and will develop a number of cross-cutting grand challenges.</p>	<p>Shaping capability: Identification of new areas and grand challenges</p>

## Aspirations for Software as an Infrastructure

In addition to these activities, EPSRC have a long-term vision for Software as an Infrastructure which will incorporate:

- Effective networking across communities
- More effective collaboration between existing EPSRC activities
- Investing in tools and frameworks to help software and hardware developers to work together to co-design hardware and software
- Developing further international links and opportunities that are beneficial to the UK community
- Developing and re-engineering existing code for existing and new architectures and encouraging code consolidation where appropriate
- Developing novel code in key application areas
- Raising awareness in institutions of the research potential, importance and value that software engineering can bring, highlighting available investment in the UK
- Developing measures and success features that Universities and Research Councils can use to recognise innovation in software provision
- Developing testing and verification suites
- Building communities of developers and users around software codes
- Developing joint funding models with industry and international partners, enabling early involvement in projects from the start, and building trust between developers, researchers and industry partners
- Providing support for professional software developers to be involved in projects from the ground up, ensuring that reliability and robustness is incorporated from the start