



RSEs together

Building careers, collaborations,
groups and communities

Alys Brett

 @alysbrett

My role in research software



Head of Software
Engineering Group



Chair of trustees

The UK's national fusion lab



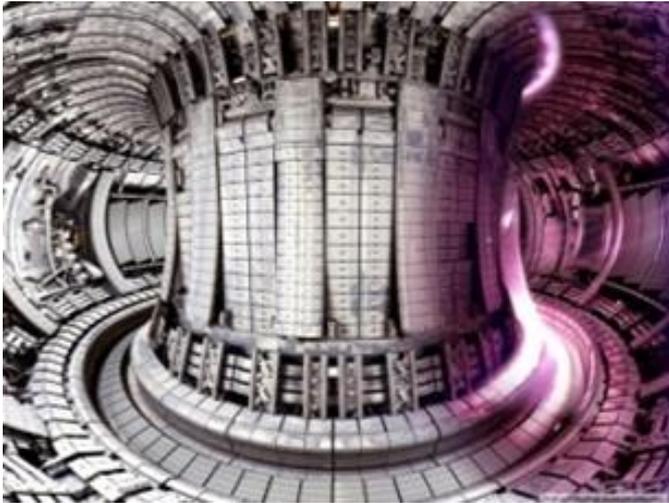
UK Atomic
Energy
Authority

Fusion energy research and related technology



Fusion energy research at UKAEA

Two Tokamak experiments

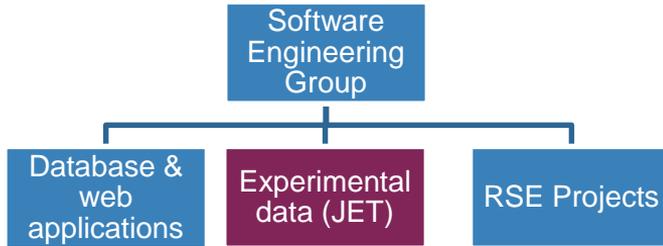


Joint European Torus - JET



UK experiment - MAST-U

UKAEA Software Engineering Group



12 members, 2 teams of RSEs

Growing fast (expect 16 or 17 during 2019)

“RSEs for JET data”



JET Data Services Overview

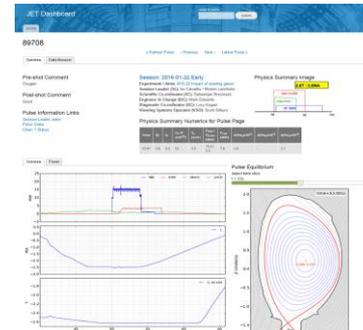
- SAL** - Simple Access Layer (SAL) is a new data API that wraps the existing data systems. It is simple to learn and easy to use.
- JPF** - Raw data: The JET Pulse File system is a collection of raw, unprocessed data from JET pulses.
- PPF** - Processed data: The Processed Pulse File system contains data from every JET pulse, simulator codes, and other services.
- CFP** - High-level data: The Central Physics File system contains data from every JET pulse public, allowing easy accessible analysis.

```
# try this in ipython
from jet.data import sal

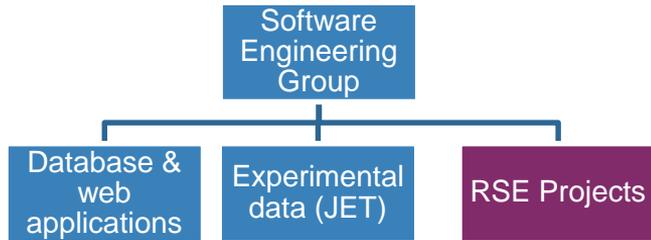
# obtain list of magnetics signals
sal.list('/pulse/87737/ppf/signal/j

# quickly plot plasma current signal
sal.show('/pulse/87737/ppf/signal/j

# read plasma current signal
s = sal.get('/pulse/87737/ppf/signa
```



UKAEA RSE projects team



6 members by October

2/3

:

1/3

Funded projects

Free at point of use activities



RSE Culham @RSECulham · 28 Nov 2018

Hello, World! We are the #RSEng team @fusionenergy - the UK's national fusion research laboratory. The world needs fusion and fusion needs good software.



The case for RSEs

What are RSEs
and why do we
need them?



SOFTWARE IS ESSENTIAL FOR RESEARCH

**BUT WE
NEED**

**BETTER
SOFTWARE
BETTER
RESEARCH**



Need access to Research Software Experts

Software is essential – convincing others

Stories

- ▶ Successes
- ▶ Cautionary tales
- ▶ Case studies
 - ▶ High profile
 - ▶ Locally-relevant

Numbers

Headline statistics from SSI research

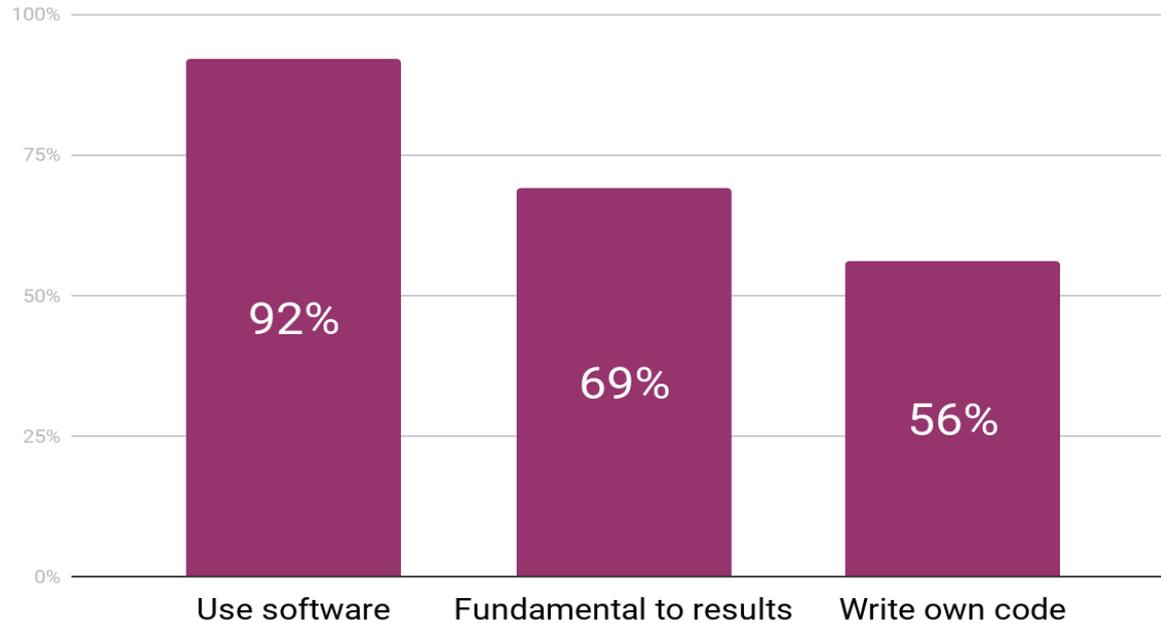
Led by Simon Hettrick
- find out more from him
(he's here)

+ www.software.ac.uk



Software
Sustainability
Institute

Researcher survey

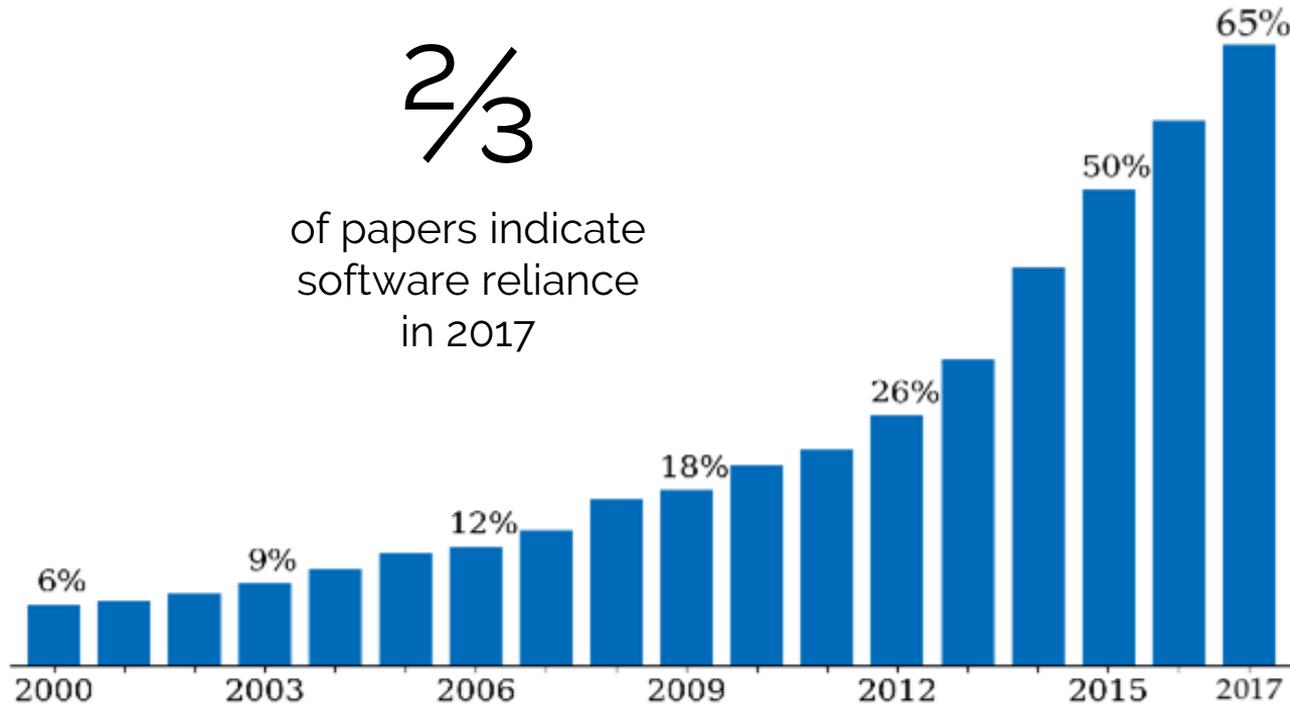


<https://goo.gl/gmHwGm>

Text analysis of papers

$\frac{2}{3}$

of papers indicate
software reliance
in 2017



Who writes research software?

Analyst Developer Analyst Programmer Analyst Programmer - SITS (x 3) Analyst/Programmer Applications Developer Applied Scientist Architectural Robotics Developer Assistant Data Programmer Assistant Project Manager Atmospheric Correction and Radiative Transfer Model Scientist Audio Software Developer - KTP Associate Bioinformatician Bioinformatician In Potato Genomics and Genetics Bioinformatician/Computational Bioscientist in Microbiology Bioinformaticians Bioinformatics Analyst Bioinformatics Postdoctoral Researcher Bioinformatics scientist Biometric Software Systems Developer Biorespository Software Developer C++ / 3D Graphics Software Engineer Casebooks Project Editor (Research Assistant/Associate) Climate Researcher (Research Associate) Clinical Study Programmer CoMPLEX Research Associate Computational Biologist / Bioinformatician Computational Scientist Computational Scientist in Computational Fluid Dynamics & Industrial Applications Computational Applications Computational Scientist in Structural Mechanics and Industrial Applications Computer Scientist Computer Vision Researcher Content Developer/Programmer Control Engineer-IMG - 3 posts CREATE Data Specialist Data Analyst Data Integration Coordinator Data Manager x3 Database and Software Engineer Database Manager/Researcher Database Programmer Digital Media Technician E-Learning Portal Manager (KTP Associate) e-Learning Systems Development Analyst e-Learning Systems Development Analyst (Moodle, SQL) E-Learning Web Developer E-Portfolio Learning Technologist Embedded Systems Engineer Engineering Technician Environmental Scientist EPSRC Studentship on Algorithmic Construction of Finsler-Lyapunov Functions Experimental Officer in Bioinformatics Experimental Psychologist Finance Assistant Gaia Alerts Software Developer Gaia Software Developer (Gaia UK Team) GIS Applications Specialist Graduate Programmer / Software Developer Graphics Programmer Health Data Manager / Scientist High Throughput Bioinformatician High Throughput Sequencing Bioinformatician (Two posts) HIVE Manager/ HIVE Coordinator HIVE Senior Researcher and Technical Lead Hydro-informatics Scientific Software Developer Image Analysis Manager for Cancer Imaging Information Systems Developer Instrumentation Engineer Investigator Statistician IT Developer IT Services Manager IT Services Specialist (e-Learning Systems) IT Support Technician (Unix / Windows Systems) Knowledge Transfer Partnership (KTP) Associate: Innovent Technologies LTD Knowledge Transfer Partnerships (KTP) Associate - Software Development (KTP Associate) Knowledge Transfer Partnership (KTP Associate) (Fixed Term Contract for 24 months) KTP Associate (Precision Agriculture Data) KTP Associate (Precision Agriculture Data) KTP Associate: Electronics / Robotics Engineer Learning Technologist Leicester Respiratory B&I IT Developer Leicester Respiratory B&I IT Developer Leicester Respiratory B&I IT Developer Marie Curie Marie Curie Early Stage Researcher in Radar Rainfall For Integrated Water Quality Modelling Marine Earth Observation Scientists Medical Statistician Medical Statistician/Senior Medical Statistician Metrology Engineer Mobile Application Developer NASC IT Support - Programmer and Systems Administrator (Fixed-term) NIHR Research Methods Follow PDRAs on EU Project on Automated Multisensor Surveillance Planning Officer Policy Modeller 2014 Post - Doctoral Research Assistant INSTRON Post Doctoral Research Worker Post Doctoral Researcher in the application of Digital Technology Post-Doctoral Research Assistant in Simulation and Visualization Post-Doctoral Researcher Post-Doctoral Researcher in the application of Digital Technology Post-Doctoral Research Associate (Pathogen Genomics) Post-Doctoral Research Fellow Postdoctoral Fellow - population genetics / evolutionary genetics Postdoctoral Fellow in Bioinformatics Postdoctoral Fellow in Cancer Therapeutics Postdoctoral Research Assistant Postdoctoral Research Assistant Postdoctoral Researcher Postdoctoral Researcher in Declarative (Logic and Functional) Programming Postdoctoral Researcher Postdoctoral Scientist Postdoctoral statistician Postdoctoral Training Fellow - Statistical and Computational Genetics of Autism Principal / Senior Bioinformatician Principal Bioinformatician Product Development Engineer (Rail) Publishing Portal Web Developer Radio Frequency Engineer Reader in Computer Science Reporting Analyst Research (Software) Engineer Research Assistant Research Associate Research Fellow Research Image Data Manager, Biomedical Engineering Research Officer Research Officer â€” Social Protection Research postgraduate Research Programmer Research Scientist Research Scientist / Senior Research Scientist Research Scientist in Machine Learning and Computer Vision Research Software Developer Research Software Developer for the Herchel Smith Professor of Organic Chemistry Research Software Engineer Research Studentship Research Worker Researcher SAP Trainee Technical Analyst Scientific Officer with Michela Garofalo Scientist SEAHA Studentship: Extracting epidemiological data from collections SEEG Data Archive Manager Senior / Research Associate in Clinical Integration and Image Analysis for Fetal Surgery Senior Analyst Programmer (Business Analysis) Senior Analyst/Programmer Senior Bioinformatician Senior Bioinformatician / Bioinformatician Senior Computational Statistician - Spatial Models Senior Data Acquisition Scientist / Data Acquisition Scientist Senior Data Manager Senior Database Administrator Senior IT Developer Analyst Senior Mathematical Modeller Senior Media Developer Senior Postdoctoral Researcher - Evolutionary and Computational Analysis of Infectious Disease (Phylogenetics) Senior Research Assistant Senior Research Associate Senior Research Associate â€” Molecular Modelling & Simulation Senior Research Associate in Quantitative Clinical MRI Senior Research Fellow Senior Research Fellow/Research Fellow in Vibration Diagnostics and Prognostics/Digital Signal Processing Senior Research Laboratory Technician Senior Research Technician Senior Software Developer in Bioinformatics Senior Software Engineer / Software Engineer Senior Statistical Epidemiologist Senior Systems Administrator Senior Technician / Demonstrator (UCMK) Senior Web Developer SharePoint Developer Software Developer Software Developer (Bioinformatics) Software Developer (KTP Associate) Software Developer x 2 Software Developer/Programmer Software Developers in e-Learning Software Engineer Software/ Database Developer (KTP Associate) Sports Programme Manager Statistical Geneticist Statistical Programmer/Data Scientist Statistician Statistician/Epidemiologist Student and Enrolment Services Manager SWCAR Information Assistant System Administrator Systems Developer Systems, Data and Applications Team Leader Teaching Fellow in Computational Methods UTRCI Research Scientist, Control Systems Web Application Programmer Web Developer

194 different job titles

Need for software experts – convincing others

We need research software to be:

- **Correct** tested, testable
- **Understandable** transparency, sustainability
- **Reproducible** research methods & ethics
- (Re)**Usable** (unlocking knowledge)
- **Easy to change** (new knowledge!)

Why is this so hard?

Missing role

Software
Engineer

Researcher
Developer

Researcher

**Researcher career structures don't
reward software focus**

The “Research Software Engineer”



**Software engineering skills +
understanding of research**

What do RSEs do?

- ▶ Build **quality** software - as **part of** research projects
- ▶ Help researchers:
 - ▶ Learn computing skills
 - ▶ Establish good practices
 - ▶ Navigate computing infrastructure

A note about names and categories

- ▶ Pre-existing roles and teams
- ▶ Job titles and group names vary
- ▶ Not everyone can use “engineer”

Community is inclusive

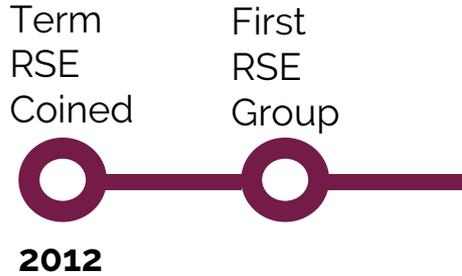
But, for recognition & improving career structures

A common name and vision is powerful



The story of the UK RSE movement

2012: Origins



SSI Collaborations Workshop - early 2012



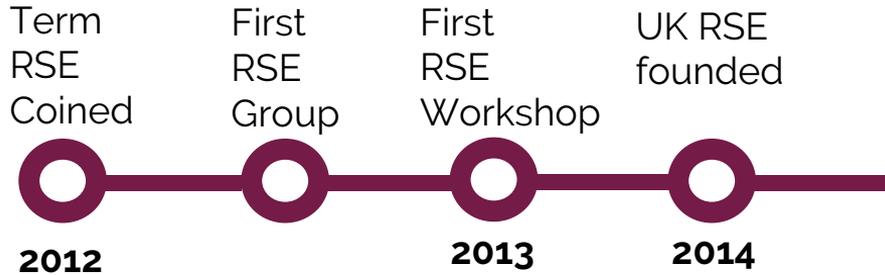
Term
"Research Software Engineer"
adopted

First RSE Group - late 2012

University College London

New model of organising
software expertise in a
University

2014: UK RSE Association founded



RSE Workshop - Sep 2013



“Should we create a community to represent RSEs?”

UK RSE Association founded early 2014

160 members in first 3 months

First elected committee - late 2014

2014/15: Early recognition



Institutions

Funding body creates dedicated **RSE fellowships** + supports RSE network



More groups established

Individuals



Ashley Towers
@ashleytowers



Following

Yay my new job title is now official - Research Software Engineer - big thanks to [@SoftwareSaved](#) for starting the movement :-D

RETWEETS
7

LIKES
8



2016 - 18: Growth and organisation

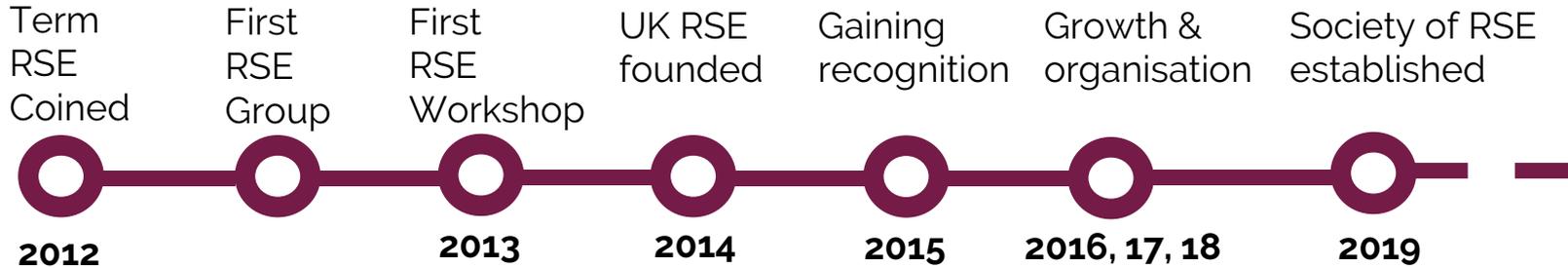


Annual RSE conferences

Growth of RSE groups



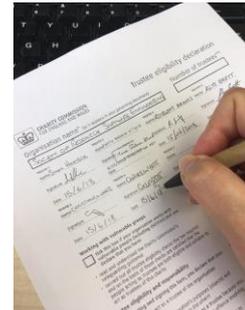
2018-19: Establishing a professional society



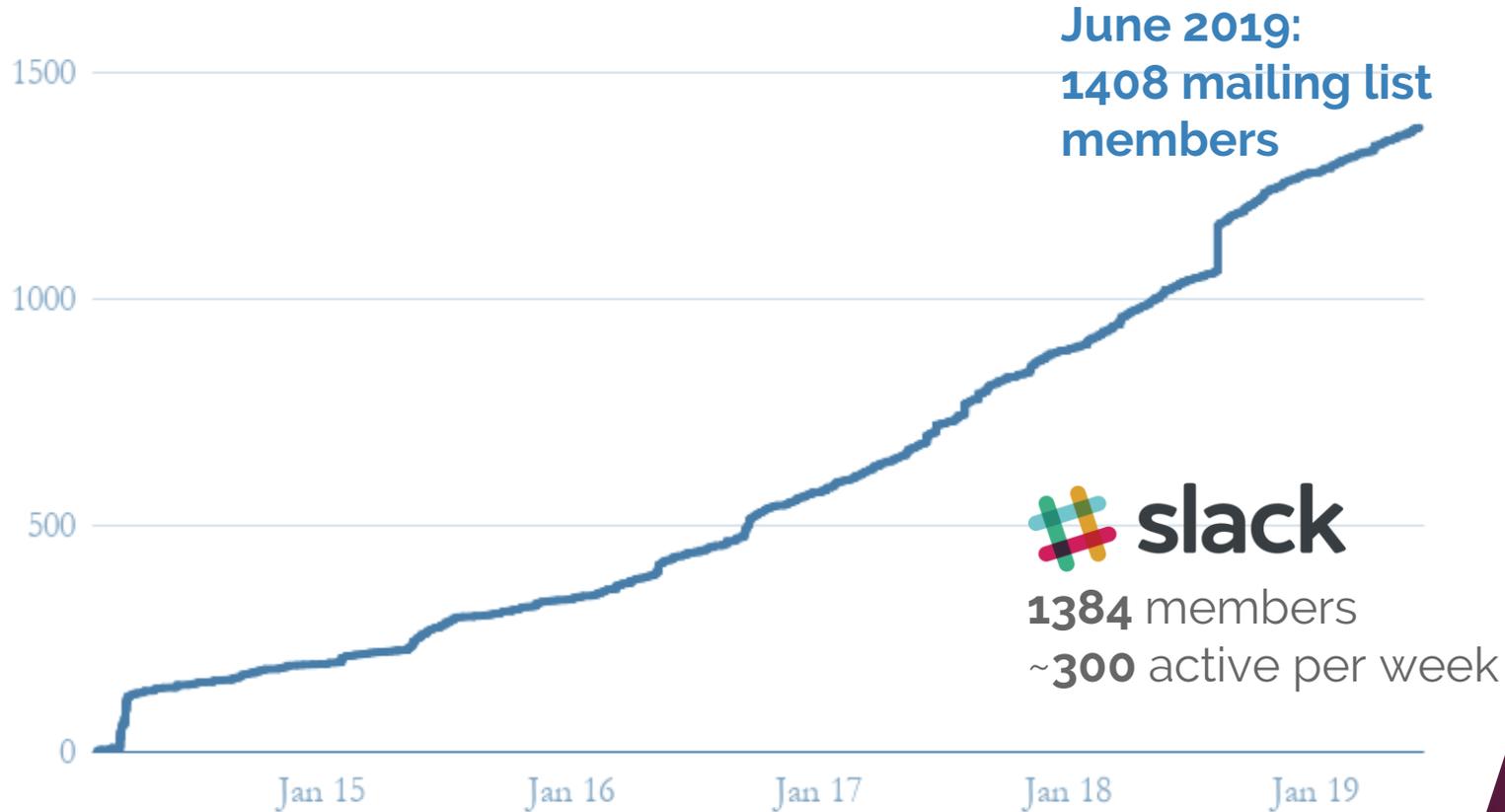
Establishing a professional society



SOCIETY OF RESEARCH
SOFTWARE ENGINEERING



Growth of the community



The Society of Research Software Engineering

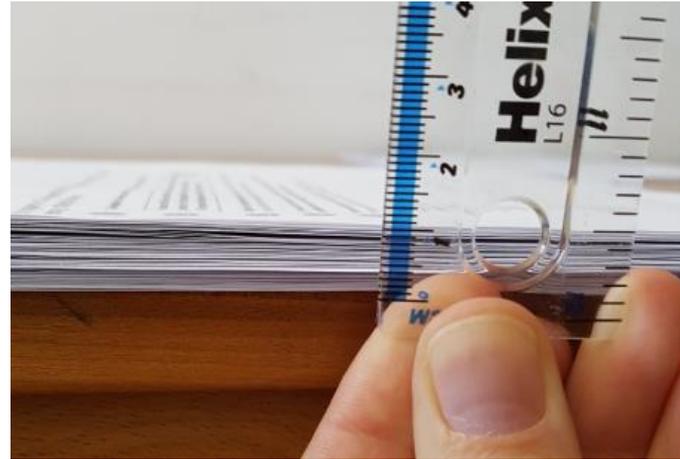
Now registered as a charity!

To further research software engineering for the good of society

- ▶ Legal entity
- ▶ Independent of any individual, university
- ▶ Elected trustees



Gearing up to accept members



RSE19

17th – 19th September

University of Birmingham, UK

Even bigger, even better!

<http://rse.ac.uk/conf2019>

Registration opens soon...



Influencing research structures, policy, funding

Senior University leaders

Consortium of leading UK universities

Initiative driven from the top to recognise importance of people who create software in research

Launching with panel at RSE19

Importance of RSEs and how Universities can support their careers

Significant win for the RSE community

- Brings RSEs into the mainstream of University concerns
- Where these universities lead, others follow

Influencing research structures, policy, funding

Funding bodies

UK Research & Innovation

Software and data experts now included in their expert advisory group

Direct input on e-infrastructure roadmap for directing funding over the coming decade

Whitepaper on software strategy to be published along with roadmap

**Some
models
that have
worked**

RSE groups

“A formal team or
group of RSEs
within an
organisation”

Benefits of RSE groups

For RSEs



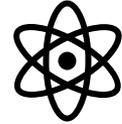
- ✓ Stable careers
- ✓ Peer group
- ✓ Recognition & development

For research projects



- ✓ Flexible access to expertise
- ✓ Sharing between projects
- ✓ Access to niche skills

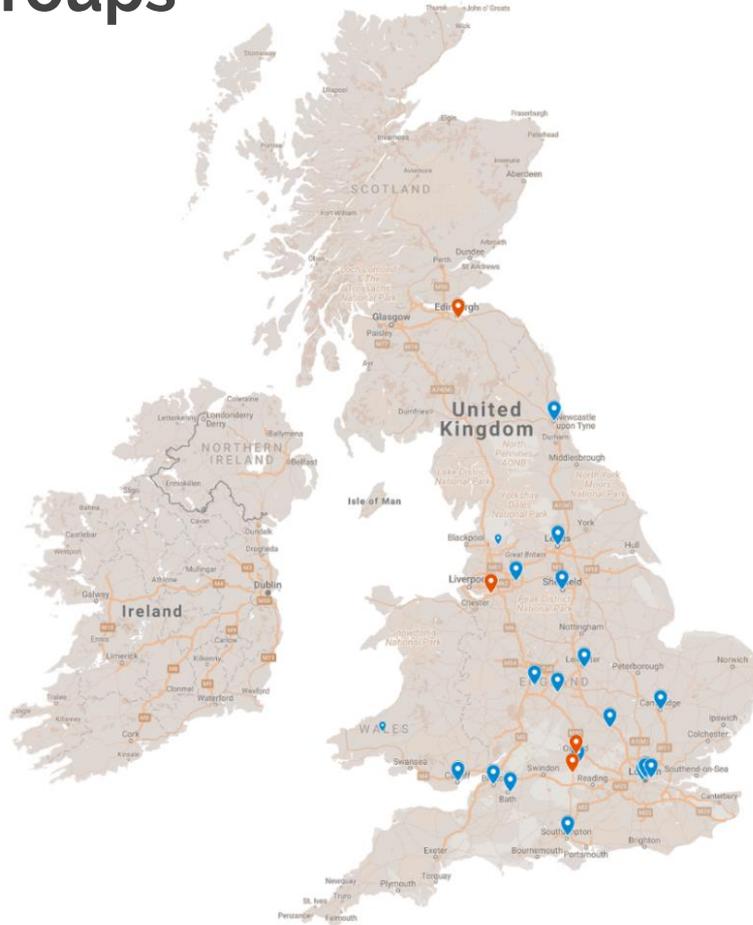
For researchers



- ✓ Help & advice
- ✓ Training
- ✓ Infrastructure
- ✓ Focus for wider network

Research software groups in UK

- Alan Turing Institute
- University of Bath
- University of Birmingham
- University of Bristol
- University of Cambridge
- University of Cardiff
- UKAEA
- Imperial College London
- Francis Crick Institute
- Kings College London
- University of Leeds
- University of Leicester
- The University of Manchester
- Newcastle University
- Open University
- The University of Sheffield
- University of Southampton
- University College London
- University of Warwick
- Queen Mary University
- EPCC
- Daresbury Laboratory
- Oxford eResearch Centre
- Software Engineering Suppo...



Support for RSE leaders (current and aspiring)

Changing roles and structures in long-established institutions is hard

RSE Leaders peer-support

For people running or trying to start RSE groups or networks

- ▶ Slack channel
- ▶ Twice-yearly meet-ups for UK RSE leaders

Learning from experience of others:

<https://www.software.ac.uk/blog/2018-04-11-secret-behind-growth-rse-groups-uk>

International RSE leaders workshop (Jan 2018)



Bringing together RSE leaders from around the world to help each other improve access to software expertise in research by pooling knowledge, coordinating efforts and establishing collaboration.

11 Countries
41 People



Read more at researchsoftware.org

EPSRC
Engineering and Physical Sciences
Research Council

**The
Alan Turing
Institute**

Aspiring RSE Leaders Workshop (May 2019)



Providing new and aspiring RSE leaders in the UK with the knowledge and network needed to drive the expansion of RSE groups

Slides:

https://drive.google.com/drive/folders/1U9KdDB3MLDGEkpWpKmHAELdUYDKrB_ iy

RSE Communities

“Networks of RSEs that are not from a single team in an organisation”

Communities within organisations

Networking Knowledge sharing Self-help

Raising the profile & status of research software work

“Research software community”

“Research Programming Hub”

“Research Software Developer Network”

“Computing seminar days”

“Software Expo”



Communities for a region, domain or specialism

Examples:

London and South East region – RSE London

 speak to Jeremy Cohen (he's here)

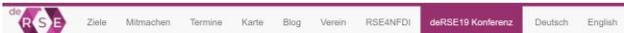
HPC Wales – uniting RSEs involved in the Welsh HPC facility

Digital Humanities - DH-RSE

National RSE Organisations

National RSE Associations

Germany: www.de-rse.org



Research Software Engineers (RSEs) - verantwortlich für wissenschaftliche Software

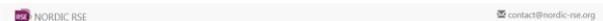
Softwareentwicklung ist ein elementarer, unverzichtbarer Bestandteil der Forschungstätigkeit. Wissenschaftliche Software unterstützt zunehmend die Gewinnung, Verarbeitung und Auswertung von empirischen Daten, aber auch die Modellierung und Simulation von komplexen Prozessen. Damit hat Software einen maßgeblichen Einfluss auf die Qualität der erzielten Forschungsergebnisse. Das Britische Software Sustainability Institut (SSI) hat dafür den Slogan "Better Software - Better Research" geprägt.

Jedoch spiegelt der aktuelle Umgang mit Software und die Bewertung der Software-Entwicklung die Bedeutung dieser Arbeit im Forschungsprozess nicht in angemessener Weise wider. Die Ursachen dafür sind breit gefächert und äußern sich in vielfältigen Befunden, zum Beispiel:

- Fehlende Anerkennung für Software-Entwicklung als wissenschaftliche Leistung
- Fehlende Verankerung im wissenschaftlichen Reputationssystem
- Eingeschränkte Verfügbarkeit und Nutzbarkeit wissenschaftlicher Software
- Mehrfach- und Parallelentwicklung
- Ungenügende Kompetenzen im Software-Engineering
- Fehlende Qualitätsstandards für die Entwicklung und den Review wissenschaftlicher Software
- Fehlende Reproduzierbarkeit, z.B. von Simulationsergebnissen
- Unklare Regelungen zur Veröffentlichung in Bezug auf Lizenzen und Intellectual Property (IP)

In der Forschung tätige Informatikerinnen und Informatiker, Wissenschaftler und Wissenschaftlerinnen, sowie andere Softwareentwicklerinnen und -entwickler sind in der RSE-Gemeinschaft zusammen gekommen und haben es sich zur Aufgabe gemacht, dieses Problem deutlich sichtbar zu machen und die gegenwärtige Situation entscheidend zu verbessern.

Nordic Countries: www.nordic-rse.org



Nordic Research Software Engineer Group

We bring together the community of people writing and contributing to research software from Nordic universities, research institutes, companies and other organizations to share knowledge, to organize meetings, and raise awareness for the scientific recognition of research software. This initiative is following the international network of other RSE groups at UK, Germany, Netherlands, and other countries.

Want to know more?

- Follow us on Twitter.
- Join us by subscribing to the [mailing list](#). By joining the community, you will stay in touch with RSEs in the Norway and you can send and receive announcements of events organized by and for RSEs. You will also be informed about our work and will have the chance to contact people like you from all corners of the research world. The more members that we have, the easier it will be to raise awareness of the importance of software in research, and the vital role RSEs play in creating this software.
- Find great reading material at [UK RSE](#) and [The Software Sustainability Institute](#)

What is a Research Software Engineer?

A growing number of people in academia combine expertise in programming with an intricate

Tweets by @nordic_rse

nordic-rse @nordic_rse
Codeminy meeting. When nordic-rse was born. Exciting!



Apr 6, 2018

nordic-rse @nordic_rse
When nordic-rse was born...

Netherlands: nl-rse.org



The Netherlands Research Software Engineer community

The increasing use of data and digital technology in academia has gone hand in hand with a strong growth in people who write and contribute to research software. Positions like data steward, information manager, research data officer, research software engineer, research supporter and other titles are increasingly recognized as intrinsic positions in the academic system.

Following the great initiatives in the UK and Germany, we plan to bring together the community of people writing and contributing to research software from Dutch universities, knowledge institutes, companies and other organizations to share knowledge, to organize meetings, and raise awareness for the scientific recognition of research software.

We are planning to organize a meet-up of Research Software Engineers in 2018. Signup to our mailing list to stay informed about any activities!

First Meetup of the Netherlands Research Software Engineer Community - register Now!

When: 20 September 2018

Tweets by @nl_rse

NL RSE Retweeted

Dutch Techcentre for Life Sciences @DTL_CF

Read the latest conference update about the DTL Communities@Work conference on 2 October in Utrecht. First workshops online at [dtl.org/2018](#)

DTL Communities@Work

Jointly building life science data solutions



7h

NL RSE Retweeted

SURFSara @SURFSara_NL

National RSE Associations

Australia & New Zealand:
<https://rse-aunz.github.io>

USA:
www.us-rse.org

RSE AU/NZ community - Recognition for Researchers who Code About

Welcome to the RSE Community in Australia and New Zealand

This website is to build awareness of the Research Software Engineer (RSE) community and to identify volunteers to help implement the practical solutions for the RSE community. If you are an academic/researcher who codes but are lacking recognition and metrics needed to progress your academic career; a 'generalist' who brings communities together and can engage with both researchers and technical staff; a professional software engineer working in the research space; or a system administrator who maintains research systems, you should think about joining.



US RSE
US RESEARCH SOFTWARE ENGINEER COMMUNITY

HOME COMMUNITY ▼ RESOURCES ▼ GET INVOLVED ▼ CAP

US-RSE

The US Research Software Engineer Community

What is an RSE?

We like an inclusive definition of Research Software Engineers to encompass those who regularly use expertise in programming to advance research. This includes researchers

Research Software Conferences



RSE18:
314 people from 12
countries



de **RSE** CONFERENCE
2019
4-6 JUNE 2019
ALBERT EINSTEIN SCIENCE PARK
POTSDAM, GERMANY



de**RSE19**
INTERNATIONAL CONFERENCE FOR
RESEARCH SOFTWARE ENGINEERS

CALL FOR CONTRIBUTIONS
<TALKS, POSTERS, WORKSHOPS>

DEADLINE
28 FEBRUARY 2019

de-rse.org/en/conf2019



Getting involved

German RSE community

2019



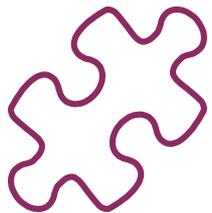
DE-RSE started,
workshops &
activities

**First RSE
conference in
Germany**



What's next?

How can you help?

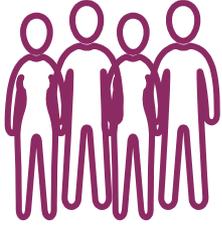


PICK WHAT FITS

You know your context
Action is needed at all scales



CHANGE IS HARD



COMMUNITIES ARE POWERFUL



BIG GOAL

SMALL STEPS

Keep going and small changes add up



**MAKE IT
HAPPEN!**

Read more

RSE State of the Nation Report
doi.org/10.5281/zenodo.495360

A not-so-brief history of Research
Software Engineers
bit.ly/NotSoBriefRSE

SSI research and articles
<https://www.software.ac.uk/tags/analysis>

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[@ResearchSoftEng](https://twitter.com/ResearchSoftEng)

Acknowledgements



The RSE community is the result of the combined efforts of many people including current and past RSE committee members and conference organisers



Thanks to Simon Hettrick and the SSI for slide content and the essential research and support that have made so much of this possible



My contribution to UK & international RSE activities is supported by UKAEA.

The fusion software described is funded by Euratom under the JET operating contract.