

Research Software Development & Management in Universities

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The University of Manchester

I ILLINOIS NCSA



Research Software and Research Software Engineers

How do we solve this?

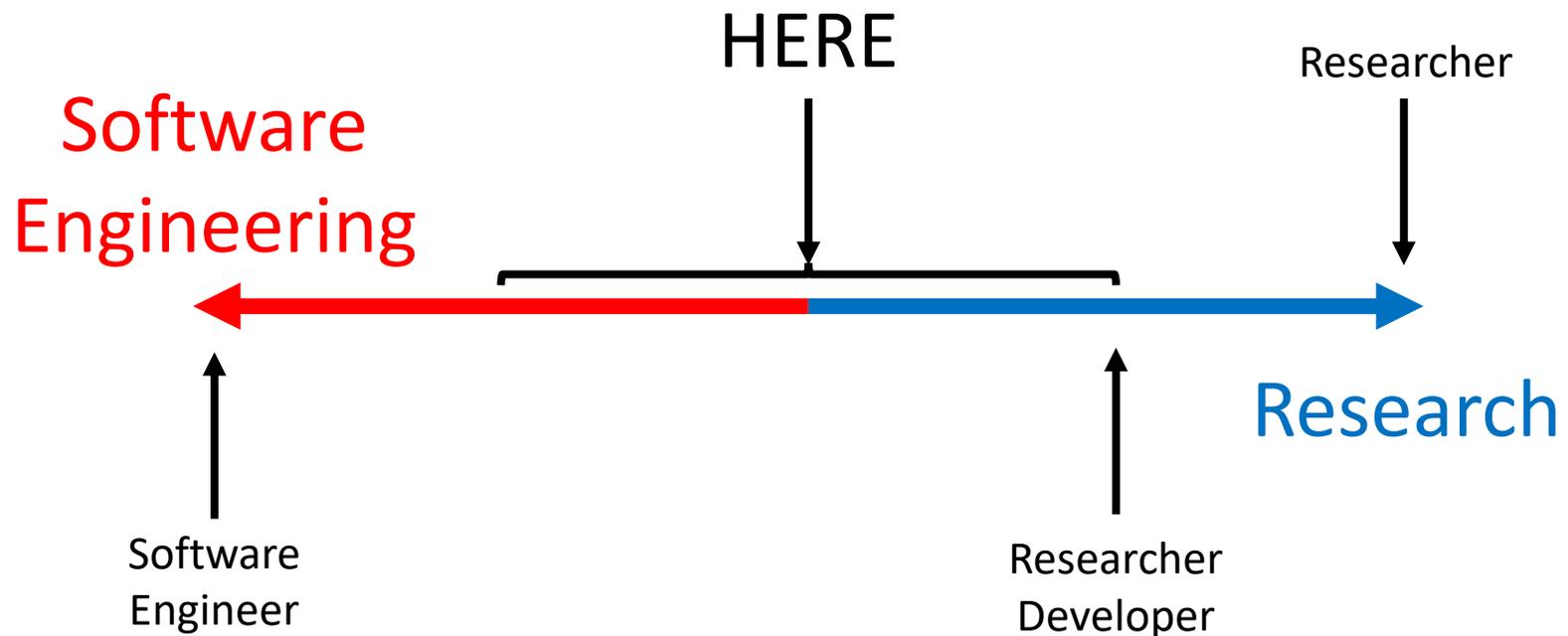
There are two hard problems in Software Engineering:

1. People
2. Convincing others that “people” is a hard problem

So, lets talk about people...



What is a Research Software Engineer?



The Craftsperson and the Scholar



Research Software Group Models

Manchester Research Software and Data Science

- Organizational context
 - IT Services, external to the Faculties
- Team size
 - 25
- Remit
 - Application support; training; short projects (weeks); research projects (months-years)
- Funding model
 - Application support and training: baseline funded (hard funding)
 - Projects: cost recovery from grants (soft funding), but underwritten by IT Services
- Job security; career progression
 - Staff hired on permanent contracts
 - Three grades of RSE: ~ graduate, postdoc, lecturer

Illinois NCSA Innovative Software and Data Analysis

- Organizational context
 - National Facility hosted at a university
- Team size
 - 25
- Remit
 - Support a given effort's individual needs; generalize those needs across projects; build software frameworks in response
- Funding model
 - Research grants (soft funding)
- Job security; career progression
 - Staff hired on fixed term contracts
 - Five grades of research programmer (RP): assistant, RP, senior, lead, principle



Notre Dame Center for Research Computing

- Organizational context
 - Part of the broader Notre Dame Research organization at the university
- Team size
 - 24
- Remit
 - Provide software development support and services to researchers
- Funding model
 - Grants, contracts, and collaborations (soft funding)
- Job security; career progression
 - Staff hired on fixed term contracts
 - Three grades of Research Programmer, roughly equivalent to first three NCSA grades



Supporting Research Software Development

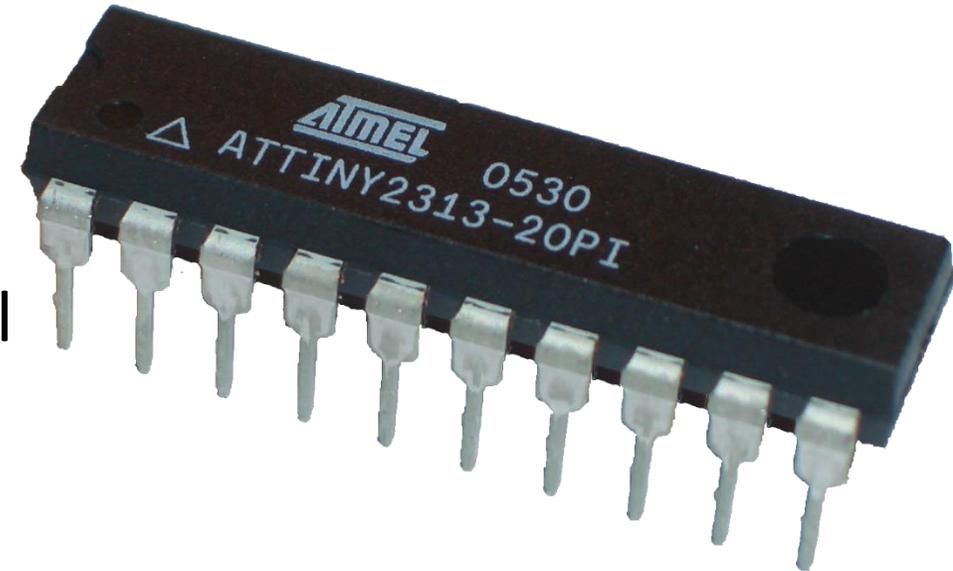
Overcoming varying finite duration funding streams

- We want to retain professional software development staff
- Grant funding
 - Often only covers parts of an RSE
 - Is of short duration
- RSE groups tend towards a form of “Matrix Management”
 - Principle Investigator axis: changes over time
 - Funded by research projects
 - RSE group manager axis: fixed
 - Funded by ... ?
- How do we fund RSE groups to set aside time for grant writing?



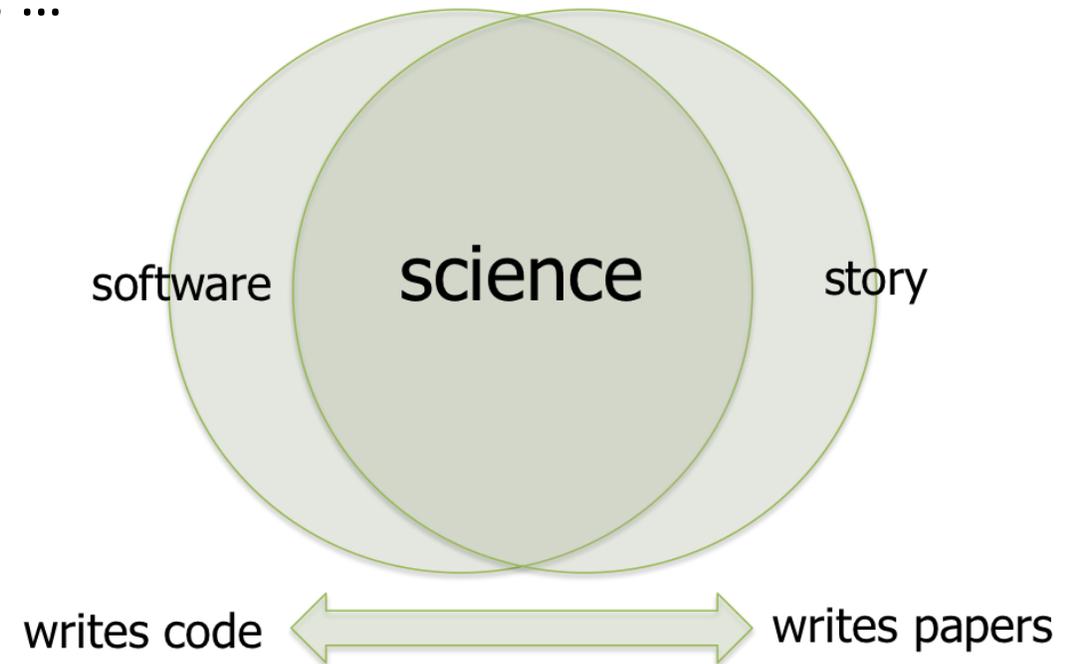
Institutional memory

- Research software is becoming more important, complex and costly
- Expertise is valuable
- Students and postdocs pack up and move on
- RSE groups with longevity beyond any individual project, can act as “institutional memory”
 - Long-term/permanent contracts
 - Contracts not aligned to projects
- RSEs are generally more mobile across domains than other research staff
 - Opportunities for translation of knowledge/artifacts across more users/communities



Changing scientific culture

- Scientific research is about scientific discovery first and foremost
- There's a long and deep culture as to what this means
 - Scientific method, students, paper publications, ...
- We're trying to change that culture
 - Or at least adapt it to include technical aspects required by modern day science
- Research is increasingly a team endeavour
 - As projects become larger and more complex, a wider range of skills is required
- Whether we write software or papers, ***we are all researchers***



Jay, *et al*; Identifying the challenges of code/theory translation; 2017; [10.3897/rio.3.e13236](https://doi.org/10.3897/rio.3.e13236)

Summary

Conclusions

- Software is becoming recognized as an *essential* part of research
- Support aspects of such software are not ... yet
 - RSE staff, RSE groups
 - Models for sustaining, citing and crediting software
- RSE-type groups are emerging globally to address these needs
- RSEs and data scientists do not work in a vacuum
 - They are key to common research activities, such as hypothesis generation, study design, data analysis, and interpretation of results
- Efforts to make this well understood and accepted by the scientific community at large are ongoing



**BETTER
SOFTWARE
BETTER
RESEARCH**

Society of Research Software Engineering

An independent organization for the RSE movement

- Membership
- Voting rights
- International

Registered Charity Number 1182455

- Same model as Royal Society of Chemistry and Institute of Physics, etc.

Sign up for membership notifications

- <https://www.society-rse.org/>

RSE Con 2019: <https://rse.ac.uk/conf2019/>



**SOCIETY OF RESEARCH
SOFTWARE ENGINEERING**

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Preprint: <https://arxiv.org/abs/1903.00732>

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