CI landscape, Four Facings and Theory-Software Translation

Sandra Gesing
sandra.gesing@nd.edu

February 4, 2019
Theory-Software Translation Workshop
New Orleans
The Four Facings defined by CaRCC

- Researcher facing
- Systems facing
- Software/data facing
- Sponsors/Stakeholder facing

- All areas are interesting for us – Where do we start?
The CI Professional Ecosystem

- Clemson-led ACI-REF project, ACI-REF VR
- Coalition for Academic Scientific Computation (CASC)
- Campus Research Computing Consortium (CaRCC)
- Campus Champions
- CyberAmbassadors
- Linux Clusters Institute
- SIGHPC Education Chapter
- Software & Data Carpentry
- Science Gateways Community Institute
- UK Research Software Engineer Association
- US Research Software Engineer Association
- UK Software Sustainability Institute
- Working Toward Sustainable Software for Science Practice and Experience (WSSSPE)
- US Research Software Sustainability Institute
- ...
Get to know our
• users (diverse research domains, faculty, …)
• stakeholders (host institution, funding bodies – NSF, NIH, DoE, DoD, DARPA, Moore Foundation, etc.)
• partners (projects, initiatives, experienced IT people)
• volunteers (contributors to open-source and/or open science)
and their challenges as well as their goals – besides publications and funding.

Often their challenges are our challenges!
• Research software solutions
• Computing resources
• Data analytics
• Preservation needs
Bridging the Gap to Data Sharing

Researchers

“the local academic community struggles to effectively manage its assets which manifested itself in a number of challenges, and as for researchers, they lacked storage capacity and data curation processes, and the institution lacked standard metadata and indexing technologies, as well as tools that would support the whole research workflow” - Digital Asset Strategy Committee, DigitalND, 2011

Libraries

Typically, data curation happens retroactively, and as a result data is either not captured at all or available metadata is incomplete.

Pressures from the Outside

“...digitally formatted scientific data resulting from unclassified research supported wholly or in part should be stored and publicly accessible to search, retrieve, and analyze.” - White House OSTP Public Access Memo, Feb. 2013
Sustainability for Cyberinfrastructure - NSF

**Elements:** Small groups - create & deploy robust capabilities for demonstrated need to advance science & engineering.

**Framework Implementations:** Larger teams organized around the development and application of common infrastructure aimed at solving common research problems, resulting in a sustainable community framework serving a diverse community or communities.

**Planning Grants for Community Cyberinfrastructure:** Focus on long-term capabilities in cyberinfrastructure to serve a research community of substantial size and disciplinary breadth.

**Community Cyberinfrastructure Implementations:** Focus on long-term hubs of excellence in cyberinfrastructure and technologies, to serve a research community of substantial size and disciplinary breadth.

SI2
Software Infrastructure for Sustained innovation

CSSI
Cyberinfrastructure for Sustained Scientific Innovation
Sustainability Institutes and Excellence Hubs are funded to support the CI and research community.

Support via implemented institutes is free for you!
Your chance to influence conceptualizations!

Implementations
- Science Gateways Community Institute
- The Molecular Sciences Software Institute
- High-Energy Physics

Conceptualizations
- URSSI
- Geospatial
- ...
State of the Art in Research

Increased complexity of

- research questions
- hardware
- software
- instruments
- data volume
- data formats

The need for end-to-end solutions for accessing data, software, computing services, and equipment specific to the needs of a science or engineering discipline.
Increased complexity of

- research questions
- hardware
- software
- instruments
- data volume
- data formats

The need for end-to-end solutions for accessing data, software, computing services, and equipment specific to the needs of a science or engineering discipline

Science Gateways!
Research Software

Use
90%  95%

Can't continue without
70%  63%

http://doi.org/10.5281/zenodo.843607
Research Software

> 50% neither formal nor informal training in software engineering

Use

90%  95%

Can't continue without

70%  63%

http://doi.org/10.5281/zenodo.843607
• Functioning of the individual and team
• Functioning of the research software
• Functioning of the research field itself

Developing a pathway to research software sustainability
Lessons Learned on International Level

UK SSI and UK Research Software Engineer Association

• Buy-in from universities
• Viable career path
• Large community
The importance of sustainability

**Sustainability** means that the software you use today will be available - and continue to be improved and supported - in the future.

Better science through superior software

Our work is focussed around four themes we believe are fundamental to doing research correctly in the digital age. These are related to **our manifesto**.

The first of these is **Skills and Training**: creating a capable research software community by enabling access to software development training for all researchers and teaching them methods to advance their research.

**Recognition and Reward** promotes and contributes to systems of credit for good software development and reuse practice.

**Career Paths** recognises and champions the varied job roles associated with research software; with a primary focus on the academic sector but suggesting industrial practice where applicable.

Finally, **Reproducible Research** promotes the fundamental place of software in supporting confidence in the research process and its results.

Taken together, these enable the efficient and effective use of software to tackle both the grand challenges that push the boundaries of human knowledge to day-to-day research software tasks.

https://www.software.ac.uk/about
What Are Our Next Steps?

How to change research culture? How to have not scattered approaches?

• Meetings with stakeholders
• Topics
• White papers
• Community building
• …
What Are Our Next Steps?

Let’s make the next steps together!

Thanks!

sandra.gesing@nd.edu