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The Sustainability of Scientific Software: Ecosystem Context and Science Policy

Content:
What is it that causes problems in the sustainability of scientific software? In this presentation I draw on empirical studies to build a framework to answer this question. Over time, software declines in scientific usefulness, driven by change in the software ecosystem surrounding a component. The work needed to maintain scientific usefulness in the face of this change is underappreciated, particularly because the work grows exponentially as users recombine software components. I'll present two approaches to manage this: suppressing complexity through architectures, and gaining visibility into recombination by end-user developers. Suppressing complexity is successfully employed by commercial and open source software developers but seems particularly difficult in Science, especially in the grant-making process. I conclude by identifying challenges to increasing visibility of end-user development and recommend policy changes to incentivize improving visibility, including software that reports its context of use, and examining published papers for evidence of software use.

Primary authors: Dr. HOWISON, James (University of Texas at Austin)
Co-authors:
Presenter: Dr. HOWISON, James (University of Texas at Austin)
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