

Special Issue on the Future of Research Software Engineers in the United States—Part II

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The first part of this two-part special issue on research software engineers (RSEs) in the United States described the role RSEs play in developing high-quality research software. RSEs are particularly important in the complex research landscape that integrates high-performance computing, data science, and machine learning. The articles in that issue focused on the current state of RSEs in the United States, including best practices and different perspectives.

The success of RSEs has become increasingly evident in recent years. As the demand for their role continues to grow, it is critical to identify and address the obstacles that hinder attracting, developing, and retaining the next generation of RSEs. Technical, social, and cultural factors contribute to these challenges, requiring a diverse range of individuals to share their experiences to develop a comprehensive strategy for moving the RSE community forward.

The articles presented in part two of the special issue offer valuable insights into the problems faced by institutions across the United States in attracting and retaining RSEs. In addition, the articles discuss strategies for building a strong RSE community for the future, including training programs, institutional support, and mentorship opportunities. Addressing these obstacles is essential to ensuring that the RSE community can continue to thrive and meet the increasing demand for their skills and expertise.

IN THIS SPECIAL ISSUE

The first article, by Mundt et al.,^{A1} examines the needs of RSEs and their importance to national research and development institutions. The authors, themselves RSEs, collaborated with eight national organizations to

identify three key areas where improvements can be made to better serve the national interest through RSE work: community establishment, hiring and retention, and recognition. To ensure the retention and cultivation of this crucial talent, it is essential for U.S. national institutions to develop appropriate career pathways for RSEs as well as to acknowledge and reward their contributions.

The second article, by Cosden et al.,^{A2} categorizes and discusses three entry paths into the RSE profession: 1) entry with a domain science background, 2) with a pure computer science background, and 3) with industrial software development experience. The article describes the relative advantages and disadvantages of entering the RSE field from each entry point. The article also identifies the training gaps present based on the RSE's entry point. Finally, the article recommends approaches for attracting and retaining a talented and diverse pool of RSEs.

The final article, by Heroux,^{A3} outlines the concept of research software science (RSS), which is closely related to research software engineering and particularly well suited for research software teams. RSS emphasizes using scientific methods to investigate and establish broadly applicable knowledge. By employing RSS, research software teams can work toward sustainable, repeatable, and reproducible software improvements that can positively impact scientific discovery.

The future directions in this line of work require a continued emphasis on understanding the challenges RSEs face in recruitment, development, and retention. This understanding will be crucial for developing practical solutions that address the diverse range of technical, social, and cultural factors contributing to these challenges.

Developing targeted strategies that focus on building a robust RSE community will be essential. Such strategies may include establishing standardized RSE

training programs and providing professional development opportunities. Additionally, institutions must recognize the significant contributions that RSEs make to research and provide the necessary support for them to succeed in their roles. With a concerted effort to address these challenges, the RSE community can continue to thrive and meet the evolving needs of the research community.

APPENDIX: RELATED ARTICLES

- A1. M. R. Mundt et al., "For the public good: Connecting, retaining, and recognizing current and future RSEs at U.S. national research laboratories and agencies," *Comput. Sci. Eng.*, vol. 24, no. 6, pp. 6–13, Nov./Dec. 2022, doi: [10.1109/MCSE.2023.3256759](https://doi.org/10.1109/MCSE.2023.3256759).
- A2. I. A. Cosden, K. McHenry, and D. S. Katz, "Research software engineers: Career entry points and training gaps," *Comput. Sci. Eng.*, vol. 24, no. 6, pp. 14–21, Nov./Dec. 2022, doi: [10.1109/MCSE.2023.3258630](https://doi.org/10.1109/MCSE.2023.3258630).
- A3. M. A. Heroux, "Research software science: Expanding the impact of research software engineering,"

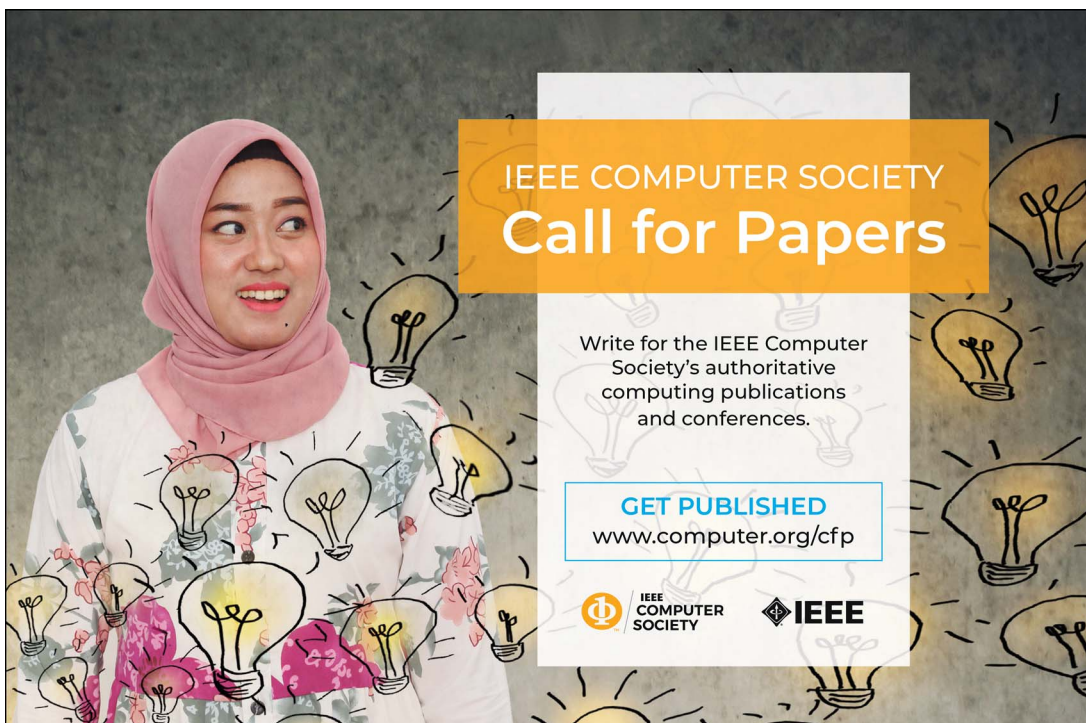
Comput. Sci. Eng., vol. 24, no. 6, pp. 22–27, Nov./Dec. 2022, doi: [10.1109/MCSE.2023.3260475](https://doi.org/10.1109/MCSE.2023.3260475).

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