Building an HPC User Documentation Process Via Layers of Writing Infrastructure

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***Abstract*— We are technical communication scholars working as guest faculty researchers at Argonne Leadership Computing Facility (ALCF) at Argonne National Laboratory in Lemont, IL. We research documentation processes for high-performance computing (HPC). We are building an applied theory of writing infrastructure to model these processes. Building and maintaining user documentation that is responsive to changing user needs and technologies for complex computing systems, such as the exascale machine Aurora, is challenging. It is a whole-facility endeavor that depends on layers of writing infrastructure that are built incrementally over time. This poster builds on our model of the documentation process for the supercomputer Aurora. It traces the timeline of building the layers of writing infrastructure, such as cross-cutting committees, networked communication tools and diverse document types, to illustrate how the process was implemented. Takeaways include the importance of a collaborative culture for documentation and a metric-driven culture of continuous improvement.**

Keywords—component, formatting, style, styling, insert *(key words)*

I. Introduction

We are technical communication scholars working as guest faculty researchers at Argonne Leadership Computing Facility (ALCF) at Argonne National Laboratory in Lemont, IL. We research documentation processes for high performance computing (HPC) and are building an applied theory of writing infrastructure to model these processes [1-4]. Building and maintaining user documentation that is responsive to changing user needs and technologies for very complex computing systems, such as the exascale machine Aurora [Fig. 1], is challenging. It is a whole-facility endeavor that depends on layers of infrastructure that are built incrementally over time.

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Fig. 1. The Aurora exascale supercomputer at ALCF.

We presented our model of the ALCF documentation process at ISC-HPC 2026 [1]. Attendees were delighted to discuss documentation processes in HPC. This poster follows up on a common question from ISC attendees: "How do we build a documentation process at our organization?"

II. Methodology

A. Gathering Data

Via ALCF staff interviews, site visits, and mining ALCF reporting documents, we mapped the complex user documentation authoring process for Aurora and built a timeline up through 2025. Timeline data is from ALCF Operational Assessment Reports 2022-2025. [7]

III. Theoretical Basis

A. Writing Infrastructure

Writing Infrastructure is a concept developed by the authors [2, 3, 4] that theorizes how writing, including documents and documentation processes, functions as an infrastructure for organizations to enact their mission, including building complex things, such as supercomputers. However, much of this writing is so embedded in the daily work of engineers, managers, administrators, government leaders, and scientists that it is hard to recognize as a phenomenon in its own right—hence, we have developed the concept of writing infrastructure [5].

As an analogy, consider how a building's HVAC, plumbing and electrical systems operate mostly out of site but are vital to the functioning of the building and the missions of the

organizations that inhabit them. If elements of the system are seen, it is only a local instance, such as an electrical outlet, not the whole system and how it is interconnected. When it comes to infrastructures of all kinds, invisibility is usually by design, because embeddedness is a key feature of what makes infrastructure effective. When it comes to writing infrastructures, making them visible has value for understanding how and why they work and creates opportunity to replicate and improve them.

B. *Example of Writing Infrastrucuture Genre Cycles*

A genre cycle is an example of a writing infrastructure. It is a mission critical document authoring process that recurs periodically and that requires the successive coordination of multiple types of documents to complete. Mapping a genre cycle, such as the annual Operational Assessment Review at ALCF, reveals how a complex report is actually the product of an organizationally embedded and coordinated process involving many stakeholders and document types over time. From previous research at ALCF (2014-2016) [6].

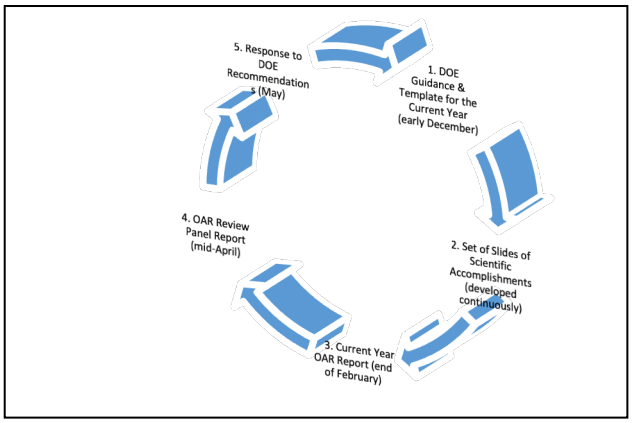


Fig. 2. The genre cycle of the Operational Assessment Review process.

IV. Model of Documentation Process at ALCF

We have previously modeled the user documentation process at ALCF [1]. This model (visible on the poster) shows the relationship between the ALCF organizational structure and the communication and team structures that comprise the documentation process—a development of Conway's Law from software engineering [7]. For example, the UX Committee is a cross-cutting team that includes leads from across all divisions of ALCF to create visibility and accountability for user documentation for the whole facility. In addition, vertical relationships, such coordinator roles in the Director's Office, provide stability for starting up documentation for new machines, such as Aurora. These workflows are mediated by networked technology tools, such as Slack and GitHub.

A. *Layers of Infrastructure*

This poster adds the concept of layers of writing infrastructure to the theory of writing infrastructure and to the ALCF documentation model. Layers of infrastructure make visible how building a complex documentation process takes time and involves building layers of organizational structure, such as cross-cutting teams, and networked communication technologies, such as GitHub and Slack.

TABLE I. Layers of Writing Infrastructure

Layer	***Description of Layer***
Diverse Doc Types	Docs include training docs, hardware & software docs, onboarding docs, online portals, AI chatbots, etc.
Networked Tools	Adopting networked tools, such as Slack and GitHub, enable easy collaboration across the facility.
Organizational Structure	Vertical org chart relationships and cross-cutting teams balance stability with responsiveness.
Metrics Tools	The user survey collects user feedback and promotes a user-centered culture.
Culture	Focused on users; Continuous improvement; Whole facility ownership of documentation

V. Partial Timeline for Building the Layers of Infrastructure

Layers of writing infrastructure are like river sediment—they are built up over time. Drawing from the 2022-2025 Operational Assessment Reports [8], we have assembled this partial timeline:

- 2022: Creation of UX Committee (organizational structure).
- 2023: New Video Channel for Users (diverse doc types).
- 2023: Migrated the AI Testbed and Aurora Documentation into GitHub. (networked tools).
- 2024: Updated/Enhanced User Notifications (diverse doc types).
- 2024: Standardized Having Slack Supporting During Training Events (networked tools).
- 2025: GitHub Upgrade: GitHub was upgraded from the free version to GitHub Enterprise (networked tools).
- 2025: Increased Internal Slack Channels (networked tools).
- 2025: Dr. Doc: An AI tool that improves ALCF user documentation. (diverse doc types)
- 2025: New Online Onboarding Guide (diverse doc types)
- Annual: User Survey (metrics tools & culture)

A. *Example of Building a Layer: Creation of the UX Committee (2022)*

The pink highlighter lines on the poster visually link the creation of the cross-cutting UX Committee on the timeline with its location on the documentation model and corresponding layer of infrastructure. The creation of the cross-cutting UX Committee was key to establishing a whole facility culture for documentation. Membership of the documentation committee was broadened to include all user-facing touchpoints.

B. Example of Building a Layer: Increased Internal Slack Channels (2025)

The yellow highlighter lines on the poster visually link the development of additional internal Slack channels to help streamline the support ticket triage process and to expedite connecting subject matter experts to documentation topics that need updating with the timeline and its location on the documentation model and the corresponding layer of infrastructure.

C. Example of Building a Layer: The Annual User Survey

The green highlighter lines trace the link between the annual user survey and its dual function as a metrics tool and a cultural tool that drives facility-wide continuous improvement for user services, including documentation.

VI. Takeaways

This poster aims to provide an answer to a frequent question from attendees at ISC-HPC 2026: How can I build a documentation process at my company or facility? Our documentation process model, with the addition of the layers of writing infrastructure, suggest two immediate takeaways to inform building and improving documentation processes in HPC.

A. A Collaborative Approach to Documentation

Our model makes visible how responsive documentation must be an all-facility endeavor. The documentation process at ALCF comprises both vertical and horizontal organizational structural relationships and relies on networked technologies, such as Slack and GitHub to enable streamlined and timely communication across all functional groups and teams.

B. Continuous Improvement

A user facility is required to report user satisfaction metrics to the funder annually. These metrics are gathered via an annual user survey. The qualitative and quantitate results of the user survey motivate a culture of continuous improvement that supports the laying of writing infrastructure documented in the timeline in Fig. 3.

VII. Next Steps

We were unfortunately not able to complete the research to compare our documentation model for ALCF with that of other DOE user facilities or other HPC organizations, as intended. We will continue to pursue this research as it will offer important information about how documentation processes vary across different organizational models and missions. Next steps include:

- Share documentation model with ALCF stakeholders and other HPC facilities.
- Compare model to documentation processes at other facilities.
- Analyze affordances and constraints of how each Lab's org structure and culture shape docs processes.

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