

arXiv Update - January 2018

During 2017, we witnessed another important milestone as arXiv logged its [one billionth download](#). Since its inception in 1991 with a focus on the high energy physics community, arXiv has significantly expanded both its subject coverage and user base. We recently added Electrical Engineering and Systems Science (EESS) and Economics (Econ) as [new subject domains](#). During 2017, the repository saw 123,523 [new submissions](#) and over 187 million downloads from all over the world. arXiv has an international scope, with submissions and readership from around the world, and collaborations with U.S. and foreign professional societies and other international organizations.

Next Generation arXiv

Based on a series of [vision-setting processes](#) that were held during 2016, in 2017 we have embarked on the next-generation arXiv (arXiv-NG) initiative with a cornerstone [grant of \\$450,000 from the Sloan Foundation](#) to improve the service's core infrastructure. The ongoing Phase I planning activities (December 2016-May 2018) aim to evaluate different scenarios for the overall development and replacement process, settle on a specific one, and initiate technical development work. Based on our evaluation, we have decided to pursue a strategy of incremental and modular renewal of the existing arXiv system ("Classic Renewal"), rather than building an entirely new system and migrating to it. After assessing various technology components and partnership options, we are now in the process of finalizing an architecture and implementing some key technology components. An integral part of the arXiv-NG initiative is to consider new organizational and staffing models to ensure continuity in operations. Sustainability principles are at the heart of the arXiv-NG initiative. We anticipate that gradual transition to a next-generation arXiv (arXiv-NG) will require an additional two years. As we continue developing arXiv-NG, we are committed to continue arXiv's robust services.

arXiv: Financial Update

arXiv's funding and governance for the current operation is based on a membership program that engages libraries and research laboratories worldwide that represent the repository's heaviest institutional users. Currently, we have [221 members](#) representing 27 countries. arXiv's [2018-2022 sustainability plan](#) includes the following sources of funding:

- CUL provides a subsidy of \$170,000, including the salary of Program Director, in support of arXiv's operational costs. In addition, CUL makes an in-kind contribution of all indirect costs, which currently represents 37% of total operating expenses.
- The Simons Foundation contributes \$100,000 per year in recognition of CUL's stewardship of arXiv. In addition, the Foundation matches \$300,000 per year of the funds generated through arXiv membership fees.
- Each member institution pledges a five-year funding commitment to support arXiv based on institutional usage ranking (the annual fees are set in six tiers from \$1,000-\$4,400).
- Grant funds from foundations and governmental agencies to sponsor new development projects.
- Online fund raising campaigns to encourage giving by the arXiv's international user community.

In 2017, arXiv raised approximately \$975,000 in addition to the Sloan Foundation grant in support of arXiv-NG. We remain grateful for the support from the Simons Foundation that has encouraged long-term community support by lowering arXiv membership fees and making participation affordable to a broader range of institutions. This model aims to ensure that the ultimate responsibility for sustaining arXiv remains with the research communities and institutions that benefit from the service most directly.

Finding new, sustainable funding avenues to support current operations and upgrades of Classic arXiv's aging code has been an important effort for the arXiv team. One of the strategies has been continuing to encourage libraries and research labs around the world to support arXiv by becoming members. In addition, after a successful pilot in 2015, we have been repeating the online fund raising campaign and during 2017 raised \$56,666 from 1,000+ arXiv users.

As reflected in the [2018 budget](#), the arXiv team is taking an integrated approach to consider the current operational system (Classic arXiv) and the next-gen system as a unified program. This approach is essential as we recruit and retain staff who will need to be conversant with the old and new systems, and transitioning from one to the other. We will strategically expand the core arXiv development team to bring new skills to the arXiv-NG project, while continuing to provide excellent support and maintenance of the production arXiv system.

Key Accomplishments and Plans for 2018

Since we started the arXiv sustainability initiative in 2010, an integral part of our work has been assessing the services, technologies, standards, and policies that constitute arXiv. Here are some of our key accomplishments from 2017 to illustrate the range of issues we have been trying to tackle. Please see the [2017 Roadmap](#) for a fuller account of our work.

- Composed of over 170 subject experts, the worldwide network of arXiv moderators is an essential component of arXiv's success. Volunteer moderators verify that submissions are topical and of interest to the scientific community, follow accepted standards of scholarly communication, and are classified in the appropriate subject categories. We continue to improve facilities for administrators and moderators in order to streamline their workflows, and to improve clarity and transparency of arXiv communications. During 2017, the arXiv team:
 - Implemented enhancements to the existing moderation Web UI to improve the proposal system based on moderator feedback.
 - Released the first beta of a new moderation interface to support arXiv's volunteer moderators. Driven by [Cycle.js](#) and backed by a RESTful API, the new interface centralizes the actions that moderators can make on a submission to a single view, reducing clicks and navigation time.
- Our development team has begun to improve various search and browse technology features, which will be deployed as a part of the arXiv-NG implementation.
- We developed and implemented methods for soliciting user input and feedback, particularly to guide arXiv-NG decision-making, including a protocol for remote usability testing and applied it to the development of new moderation interface.
- Based on the [arXiv user survey](#), extracting cited references from arXiv papers and providing links to those references for readers was identified for development under the [2017 arXiv Roadmap](#). We undertook an exploratory project focused on reference extraction and possible scenarios for reference linking.
- We successfully deployed an updated TeX processing and production system. It incorporates TeX Live 2016 as well as numerous local

add-ons that have been upgraded to the latest versions.

- As 2017 was the last year of arXiv's first 5-year [business model](#), working with the Member Advisory Board (MAB), the arXiv team finalized the 2018-2022 business planning process and sought feedback from the members libraries. See: [2018-2022 FAQ](#).
- arXiv received \$322,000 from the Heising-Simons Foundation to contribute to the arXiv-NG initiative. The grant from the Heising-Simons Foundation, which follows a \$450,000 grant from the Sloan Foundation, will help fund the creation of a scalable, cost-efficient, and reliable infrastructure for the site, which currently relies on aging legacy code.
- arXiv team is proud to be the recipient of the [2017 Physics-Astronomy-Mathematics \(PAM\) Division Award](#) from the Special Libraries Association. The Award is given annually for a significant contribution to the literature of physics, mathematics or astronomy, or to honor work that demonstrably improves the exchange of information in those fields.
- arXiv's subject domain has been expanded with the addition of EESS: (Electrical Engineering and Systems Science) and Econ: (Economics).
- We continued to assess and refine arXiv's organizational and governance model and held an annual meeting for the Scientific Advisory Board (SAB) and Member Advisory Board (MAB) to discuss IT development priorities, financial state, moderation tools and policies, and fund raising strategies.
- On the staffing front, in order to strengthen the daily oversight of arXiv and the arXiv NG development process, we continue to modify our team and are pleased to bring in two new colleagues. Steinn Sigurdsson, Professor of Astrophysics at the Pennsylvania State University, has assumed the part-time Scientific Director position in August 2017. Another important addition to our team has been Erick Peirson. As Lead System Architect, Erick works with the arXiv development team to evolve the current system to become the next generation of [arXiv.org](#) (arXiv-NG). Here's our [organizational structure](#).

The [2018 Roadmap](#) includes our goals as we strive to improve the technical infrastructure, moderation system, user support, and the sustainability framework. Additional information about arXiv is available on [arXiv Public Wiki](#), including annual budgets, reports, roadmaps, and [arXiv.org blog](#). As it is evident from this brief update, changes are afoot for arXiv, including new initiatives and funding sources, all aimed at ensuring that the scientific scholarship repository remains free, open, essential and sustainable. We salute the contributions of 170 volunteer moderators who are crucial to our operation. We remain grateful for strong support from our member organizations, Simons Foundation, and essential contributions from arXiv's advisory groups as they consistently provide us with input as representatives of scientific and library communities. Also we'd like to thank the Sloan Foundation and the Heising-Simons Foundation for their generous support of the arXiv-NG initiative.

Cornell University Library, arXiv Leadership Team

Oya Y. Rieger (Program Director), Steinn Sigurdsson (Scientific Director), Jim Entwood (Operations Manager), Martin Lessmeister (IT Lead), Sandy Payette (Technology Strategy Advisor), Erick Peirson (Lead Architect), Gail Steinhart (Program Associate)

[Website](#): [arXiv Public Wiki](#)

[Contact email](#): support@arXiv.org

[Updates](#): If you are interested in getting updates from the arXiv team and have not yet signed up for the mailing list, send an email message to: arxiv-support-updates-L-request@cornell.edu. Leave the subject line blank and the body of the message should be a single word: *join*