Increasing Japanese Open Access Using JAIRO Cloud

1. Nominator's statement

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Jun Adachi, Deputy Director, National Institute of Informatics, Japan

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The National Institute of Informatics (NII)[1], Japan, is an inter-university research institution with two major missions for Japanese academia: to conduct research and graduate-level education as a research center of informatics studies, and to deploy and promote cyber-infrastructure for scholarly communication in Japan. NII could be one-of-a-kind, characterized by its organic combination of these two distinct missions.

NII pursues three core activities required for building academic information infrastructure. Firstly, we maintain the cutting-edge computer network required for large-scale scientific research in high-energy physics, astronomy, seismology, etc. Secondly, we provide scholarly digital information for research and higher education, such as electronic journals in cooperation with university libraries. Thirdly, we assist human resource development by providing training courses and seminars to foster experts needed in academic IT activities.

In the last decade, NII has made efforts to develop this infrastructure into the Cyber Science Infrastructure (CSI), a key system for university information environments that incorporates various research activities and disseminates digital information from universities and research institutions. Researchers and students are able to share and use scientific software and databases, and information resources such as supercomputers and other distinctive scientific utilities, through our super high-speed network across organizational and subject field borders.

The framework for development and dissemination of scholarly information is also an indispensable part of the CSI. NII has been building this framework in close cooperation with Japanese university libraries.

In 2011 NII concluded a memorandum of understanding with university libraries in order to strengthen cooperation in developing a scholarly information infrastructure in the digital era. The parties agreed on the following aims:

- Promoting open access to a variety of scholarly information resources through institutional repositories
- Enlarging access to subscription materials such as e-journals and e-books via consortium licensing
- Enriching the union catalog database (NACSIS-CAT), which also covers e-resources

For the past several years, NII has endeavored to promote the development of institutional repositories in Japan. One of the most important roles of NII is to provide funding to libraries by commissioning various projects led by libraries.

By channeling the motivation of librarians, NII has supported the start-up of repositories, promoted research and development activities on repositories, and assisted community-building in a variety of sponsored projects. This scheme was effective in sharing practical information among participants, particularly in small- and medium-sized universities that do not have enough staff for repository building.

With such support from NII and with the great efforts made by libraries, the number of institutions that develop a repository has grown rapidly over the past ten years. So far, nearly 300 institutions run their own repositories in Japan, and over one million items have been added to these repositories.

Based on the success of the repository project, NII decided in 2011 to take the next step toward further expansion. JAIRO Cloud[2] is NII's cloud computing facility dedicated to operating university institutional repositories. In 2012 we officially launched JAIRO Cloud as a SaaS (software as a service), and over 100 libraries have already taken full advantage of this service.

JAIRO Cloud uses WEKO as its repository software platform, developed and maintained as open software by NII technical staff. The use of a common platform for all participating libraries makes systems operation easier and more efficient, and has eventually resulted in accelerating the sharing of skills and expertise among libraries that had been hesitating to install in-house computer systems.

The successful introduction of a cloud computing facility to the Japanese repository arena and the steep rise in the number of repositories demonstrates the forward-looking attitude of Japanese university librarians. This is expected to eventually change the quality and capacity of open access in Japan. Coincidentally, in 2013 the Japanese Ministry of Education, Culture, Sports, Science and Technology, which administers higher education and research, mandated the digitalization of doctoral dissertations and their dissemination over the network. This legislation helped JAIRO Cloud to be acknowledged as the most important means for such dissemination.

NII commits to making maximum efforts to develop JAIRO Cloud into a more comprehensive infrastructure for enhancing and refining Japanese institutional repositories in close coordination with university libraries.

Japanese university libraries and NII would be highly honored to be awarded the Stanford Prize for Innovation in Research Libraries.

References

1 National Institute of Informatics (NII) website < http://www.nii.ac.jp/en/>

2 JAIRO Cloud community website (in Japanese) <https://community.repo.nii.ac.jp/>

2. Narrative description

Background

Successive waves of human development have been characterized by transitions between the forces of centralization and distribution. The evolution of information technology is a good example of this interplay, with shifts from mainframes to personal computers, to centralized services provided over a common network. Current trends are towards centralization through cloud computing, partly due to cost-effectiveness. One of academia's major roles is the preservation of knowledge, which incidentally makes changing academia notoriously difficult. JAIRO Cloud is a pioneering academic activity in Japan, designed to demonstrate that cloud computing offers major tangible benefits to research itself, not just in financial terms.

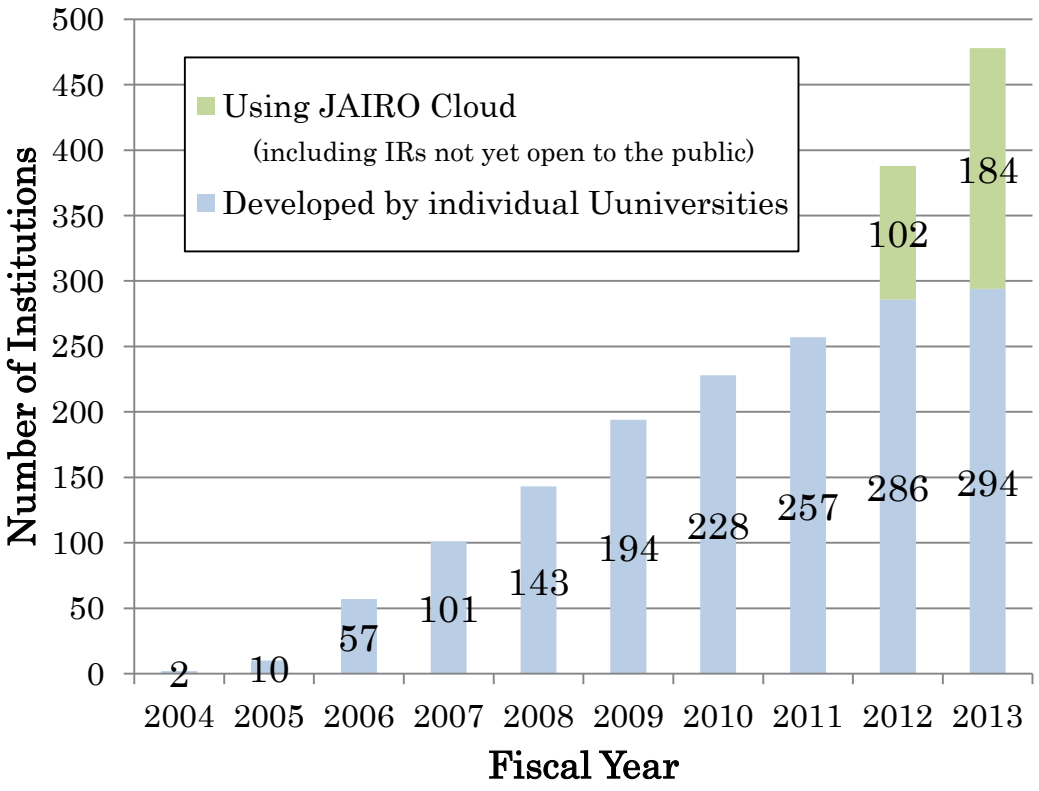

Figure 1 Number of Institutions with Repositories in Japan

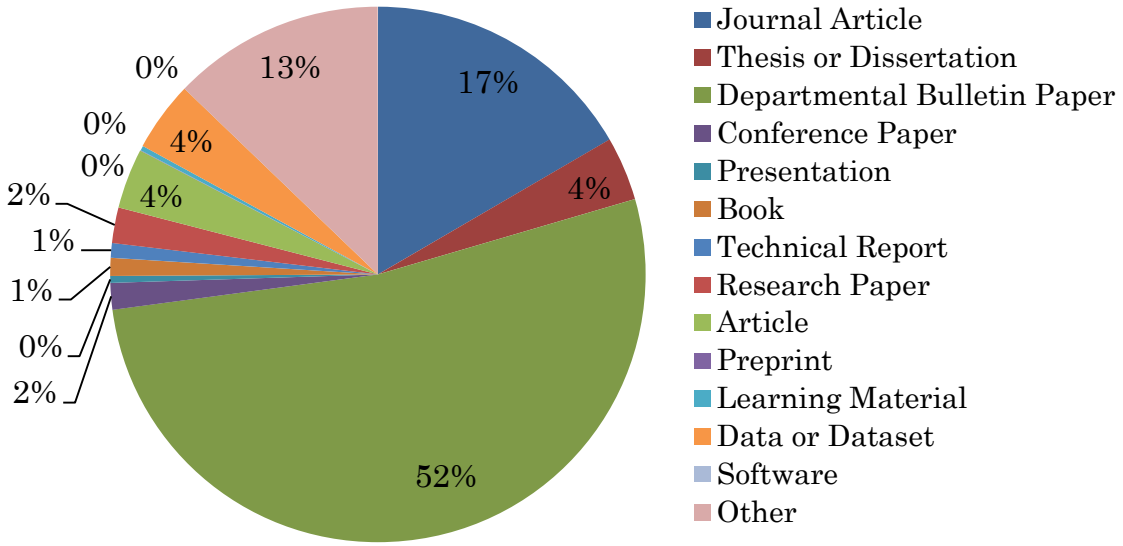

Figure 2 Content Type stored in Japanese Institutional Repositories

As in the United States and Europe, institutional repositories (IR) in universities in Japan were created with high expectations of large-scale open access (OA). The National Institute of Informatics (NII) has two core missions: to serve as a research center for information science, and to foster inter-university collaboration, which historically has consisted primarily of supporting information and communication technology infrastructure for higher education in Japan. Since NII has strong links with university libraries, one of our missions is to provide a system infrastructure to university libraries. Supporting IR activities in university libraries has long been an important project for NII and a Cyber Science Infrastructure program was initiated in 2005. Under the auspices of this program, we started a project to directly fund institutional repositories in order to support community deployment and development. As shown in Figure 1, the achievements of the project were remarkable. By the end of 2013, the number of institutions with repositories grew to roughly 400. The total number of the items registered in those repositories increased to more than a million. Figure 2 shows content type for 2013. Most of the content was departmental bulletins, publication media typical in the humanities and social sciences. Before this wide-scale IR deployment, most departmental bulletin papers were paper publications, but the development of repositories has helped in the transition from paper to electronic publication. The wide-scale use of IR also increased the visibility of the departments'

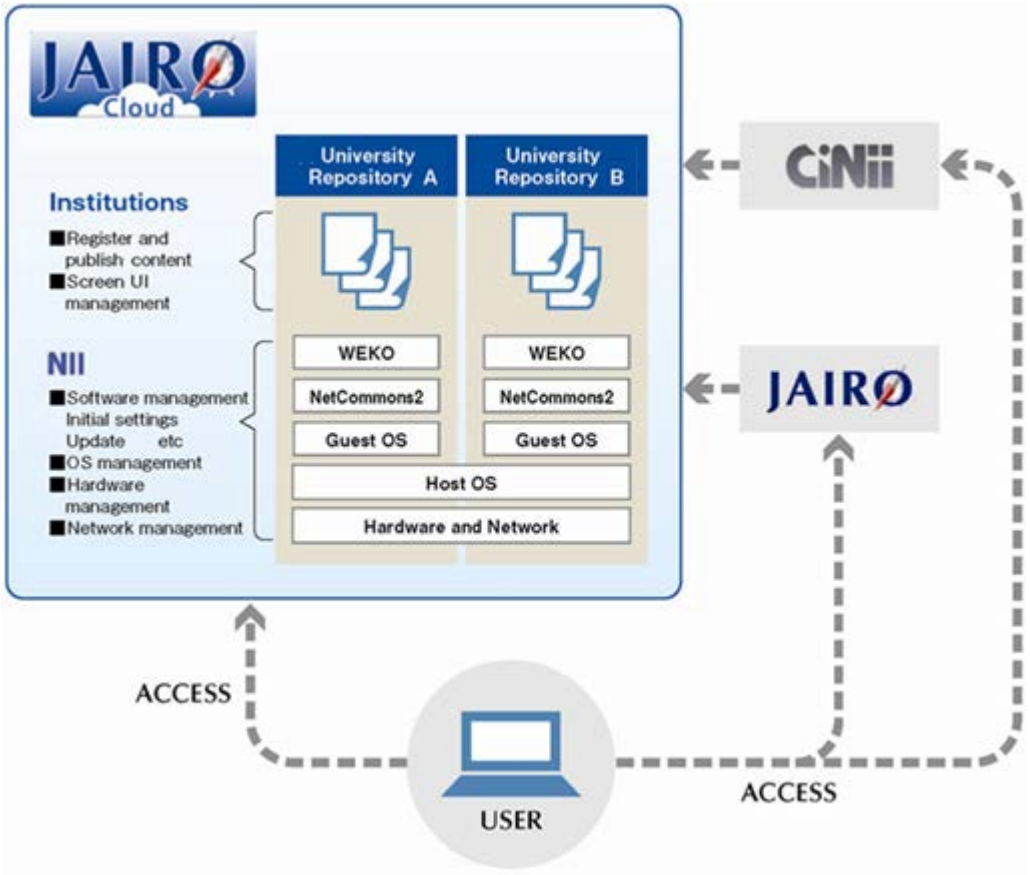

Figure 3 Service Architecture of JAIRO Cloud

work, transforming local publication into global publication. In addition to funding IR propagation, we developed a separate system, the Institutional Repositories Database (IRDB), to aggregate metadata from all over Japan using the OAI-PMH protocol and Junii2, our custom metadata schema. Figure 2 shows other aspects of this aggregated data. The metadata provided by IRs is also transmitted to CiNii, a specialized Japanese article search engine. CiNii is searched more than 58 million times per year, which demonstrates how vital this service has become, especially for students and researchers in the humanities and social sciences. Our IR activity greatly increases content availability in CiNii. The benefits to researchers in disciplines which had historically published only in narrowly distributed departmental bulletin papers are obvious. Our IR project arguably triggered a revolution in scholarly publishing workflow in these disciplines in Japan.

However, IRs developed by individual universities are entirely self-contained distribution systems. Each university must secure sufficient funds to launch and persist

Figure 4 Example of the top page of repositories in JAIRO Cloud

this service. There are more than 700 universities in Japan, which meant we were fiscally unable to support every university, despite the interest of library staff. As can be seen by the gray bar in Figure 1, it became obvious that the growth curve was plateauing. Our project succeeded in bringing an OA culture to universities through the implementation of IRs, but progress can still be made, particularly with private universities. Anticipating the completion of the initial project and noting these lingering gaps, we began devising ways to further improve access to knowledge in Japan.

Our Challenge with JAIRO Cloud

An opportunity to increase OA to knowledge has come with the tide of cloud computing. Despite the progress made through the funding of multiple disparate IRs, the value of a centralized IR cloud service was obvious. Through our previous work and conversations with universities, we already knew that many universities desired to run an IR but didn't have the resources to do so. In response, we launched the JAIRO Cloud concept in 2010, a SaaS-type IR cloud service[3]. Figure 3 shows the service architecture of JAIRO Cloud. The actual deployment was accomplished using previously developed repository software, WEKO, a name borrowed from Swahili meaning “repository”[4, 5]. It was developed as a module for an AJAX-oriented content management system called NetCommons2, which itself was developed separately by NII. NetCommons2 is remarkably accessible and easy to use. A user can build a web page using only a mouse. The IR is one of the primary faces of a university's scholarly communication, making customization and design of IR pages a crucial feature. Generally, to permit such customization a service provider has to allow login-level access to a server to allow direct modification of template or HTML files. This has important security implications for the service provider, so we sought to allow extensive customization via just an Internet browser. Advantages of the NetCommons2 functionality can be seen in Figure 4, which shows examples of repository top pages operated by JAIRO Cloud users. In 2011, we started pilot operation with several early-adopter universities. Beyond

Figure 5 JAIRO cloud workshop

providing infrastructure, we offered workshops nationwide to assist end users in learning how to use the system. The community built through these workshops, with more than 600 participants, in turn used this knowledge base to train other local users. Figure 5 shows examples of workshops held at NII. In 2012, we established a formal workflow and entered stable system operation, allowing JAIRO Cloud to become a production-level service. The green bars in Figure 1 show the growth of JAIRO Cloud. Remarkably, and in contrast with the previous IR project, most of the participants in JAIRO Cloud are private universities. This demonstrates our success in widening the spectrum of IR use in Japan.

OpenDOAR service statistics show that as of 10 January 2014, there were 2,554 IRs around the world. As measured by OpenDOAR, the United States has the most, with 435 IRs. However, counting each tenant of the JAIRO Cloud service, the number of Japanese IRs at the corresponding date was 479. As many of the IRs in Japan have not yet been registered with OpenDOAR, Japan could soon catch up with the United States in terms of IR activity. JAIRO Cloud participation has continued to increase very rapidly despite the short time it has been in operation. The accumulation and subsequent distribution of content has demonstrably improved the ability of researchers to search for and further develop knowledge. In three years, more than 110,000 items have been deposited in IRs in JAIRO Cloud. It greatly contributes to building cyber science infrastructure in Japan. JAIRO Cloud, although growing, is already a powerful tool in support of research.

Future Perspective

JAIRO Cloud has caught the leading edge of the broader transition to cloud services, playing a pivotal role in the increase of both the scale and scope of IR deployment and resulting open access to content. The majority of content published to IR in JAIRO Cloud can be classified as gold OA – bulletin papers published by universities. The most

important achievement resulting from this increase in digital circulation thus far is the accelerated transition from paper to widely accessible gold OA. New doctoral degree regulations established by the Japanese government dictate that all doctoral theses be made publicly accessible in digital form. The regulation explicitly points to the IR as a desirable publication medium. We believe that this mandate would have been difficult for universities to fulfill without the broad and deep success of JAIRO Cloud. Despite the remarkable achievements of these projects, OA mandate within the university faculty has not yet been completely fulfilled and our work continues.

We estimate that we have reached the halfway mark of our OA project. Our goal is to eventually see green OA activity, but so far there is insufficient content to achieve that status on JAIRO Cloud. Assisting libraries to meet this goal requires our project to focus not on the total number of IRs, but instead on fostering a widespread OA philosophy in Japanese academia. Our goal must not be simply assisting universities in achieving archival marks and the deployment of an IR, but instead the cultivation of a wide and deep understanding of the greater value of OA throughout Japanese academia.

We have already begun our transition to meet this more fundamental goal. The initial step was to surround the centralized infrastructure with the wider academic library community. JAIRO Cloud then aligned its development cycle with this community and embraced librarians' input and vision. Today, the community requests new functionality, and we respond by implementing new features. The web pages of the JAIRO Cloud community as shown in Figure 6 are operated by WEKO on Net Commons2. Announcements regarding the JAIRO Cloud system, operating guides, and other information are available here. The community site also provides answers to inquiries about JAIRO Cloud. The most pressing current community need is incentivization of faculty to accept OA and improved workflow within JAIRO Cloud. Some of the development work we have already done to meet community requests includes statistical feedback to contributors on access of their papers and dynamic references to copyright policy databases such as the UK's SHERPA/RoMEO and Japan's Society Copyright Policies in Japan (SCPJ). The JAIRO Cloud community connects NII to a wide range of OA contributor and research communities.

Our next challenge is to encourage the development of a university-wide OA mandate, a policy that is not yet in effect at any university in Japan. We also want to incorporate JAIRO Cloud more deeply into library and research workflows. We would like to make

Figure 6 Web pages of the JAIRO Cloud community

JAIRO Cloud an integral infrastructure component in support of research. Moreover, our experiences in delivering the service will allow us to focus in the future on rich content and research data in addition to pure textual repository.

NII and JAIRO Cloud also consider evangelism of OA within Asia to be an important component of our mission. Understanding of the value of OA and the importance of contributing towards the global knowledge base is still developing in Asia. From the beginning of our projects we have received consistent assistance from the United States and Europe that has advanced our OA activity. Now we can pay forward the investment in OA in Japan by working with other Asian countries. The repository infrastructure, while important, is just a tool. The ultimate goal needs to be the propagation of the philosophy of OA and its inherent benefits for research. Through our activities, we aim to promote and support the activity of Japanese researchers, not only for Japan, but as members of the global research community.

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4. Letters of support and testimonials

JAIRO Cloud Is the Best Choice

We were hoping to be able to build an institutional repository ourselves, but there were no staff that could create and manage the system, and we were unable to get the assistance of our university's IT department. That's why we considered using a cloud approach. JAIRO Cloud was the best candidate. The interface is easy to understand, and has been very well received.

Masaru Sasaki, Sapporo University Library

JAIRO Cloud Is Vital for "Hitoreposy"

"Hitoreposy" is a coined word consisting of "hitori"–meaning alone in Japanese–and "repository", where a manager has to do everything about the repository by him or herself. Also, "Futareposy" is made up of "futari" (two persons) and repository.

JAIRO Cloud is vital for "Hitoreposy." The fact that the system operations are being handled and being able to gain support from community members is of great help.

Yuichi Masuda, Azabu University Center for Science Information Service

Feedback and Requests Are Swiftly Reflected in System Improvements

JAIRO Cloud provides timely system improvements that reflect feedback and requests from institutions encountering similar problems. We enjoy a close relationship with the support office as we carry out our day-to-day registration work. We use GakuNin, the Academic Access Management Federation in Japan, so we look forward to even more wide-ranging usage of information sources through future integration with additional resources.

Hitomi Seno, Toyohashi University of Technology Library

Custom Tailoring Is Possible with a Little Ingenuity

We've been using JAIRO Cloud for 3 months, after 3 months of preparation. We're still just starting out, but we've done a fair amount of customization. WEKO is a sturdy, dependable platform on which we can build our repository, like the proverbial house built on solid rock instead of sand. Construction is fairly easy, provided you have the right materials, and custom tailoring is even possible with a little ingenuity. We are now realizing that there was no need for the concerns we felt.

Masako Iwanaga, Kagoshima Immaculate Heart University Library

No Worry about Systems, If You Go with JAIRO Cloud

It is about half a year since we started our institutional repository with JAIRO Cloud. We really appreciate that we do not have to worry about the systems, though there are some constraints arising from the shared environment. We are now getting requests from professors to release their works through the repository. We hope to use it for further publicity activities in the future.

Chie Tanimoto,
Kobe City University of Foreign Studies Academic Information Center

Without JAIRO Cloud, We Would Not Have Been Able to Create a Repository

For small libraries such as ours, it would have been impossible to create a repository without the Repository of Shinshu and JAIRO Cloud. We still haven't tapped its full potential, but we're working to tailor the site's design and content to convey our own unique appeal!

Takeshi Tamaki, Matsumoto University Library