Smarter Libraries through Technology:

Cloud Computing Reshapes Library IT Expectations

By Marshall Breeding

The technology infrastructure in libraries and other organizations continues to see a major shift away from local installations to various forms of externally hosted deployments. SirsiDynix, for example, recently announced that it now hosts software for more than 2,000 of its customers. Products such as OCLC's WorldShare Management Services, Ex Libris Alma, and Apollo from Biblionix, are available only through software as a service. The majority of libraries implementing a new integrated library system (ILS) opt for a vendor-hosted solution, even when there is an option to host locally. Even libraries continuing with a given ILS often shift from local implementation to hosted services from their vendor at the point of contract renewal or when their server equipment reaches its end of life. These factors result in the move toward hosted services as one of the pronounced library technology trends currently underway.

Often characterized as the move to the cloud, the move away from local hosting of systems brings major implications for how libraries will budget and manage technology and for the career tracks of technologists. It's no great surprise that the tasks and activities within technology-focused professions change rapidly—and that skills must continually adapt. The shift toward hosted systems simply represents the latest technology change, which demands that organizations and individuals reorient their perspectives.

Systems installed in house come with a slate of responsibilities for their technical and operational management. These responsibilities correspond to the layers of the technology stack:

- The **hardware** itself, such as servers and storage arrays, needs to be procured, installed, monitored, and periodically upgraded or replaced. This equipment must be housed in proper environmental conditions, including adequate cooling and fire controls. It is routine to rely on service from the manufactures for hardware repairs, but having technicians with expertise in dealing with server hardware components can be invaluable for organizations that operate their own data centers.
- **Network** support for a local system involves a cluster of activities, ranging from basic connectivity via switches and routers to protecting security via carefully configured firewalls, anti-malware appliances, and other defensive equipment. Other tasks include management of IP addresses, now IPv6 as well as the longstanding IPv4, DNS naming, digital certificates, and configuration of ports and protocols. The configuration of web services and APIs to operate via encrypted HTTPS protocols has recently become a vital component of deploying systems in a way that enhances security and protects the privacy of customer activity and institutional data.
- **Operating systems** likewise require attention. Both Microsoft Windows and the various flavors of Linux or Windows require administrators to test and apply periodic updates and security patches. The management of a server running

either operating system requires detailed knowledge of the many internal components and utilities. Complex installations may require monitoring of resources, such as memory, CPU utilization, and network bandwidth. Competent system administrators will have a deep understanding of each component of the operating system. System administrators will need the skills to create scripts, schedule scripts, and batch routines needed to ensure the ongoing stability and performance of the server and its resident applications.

- Almost all major business applications, such as ILSs, rely on **databases** that also require careful attention. A database administrator (DBA) will have intimate knowledge of the capabilities of the database management system involved. A DBA will be able to implement and maintain the configuration and tuning parameters to ensure data integrity and optimal performance.
- **Data backups and disaster recovery** planning provides essential preparations for any possible failure that could potentially result in the loss of data. These routines must be periodically tested and validated. Reliable backups are especially important given the recent spate of ransomware attacks in which malicious intruders encrypt data and demand payment to provide the keys necessary to release them. Backups must be isolated from the system in such a way that they are not also attacked along with the active versions.
- The main **application software**, such as an ILS, also requires considerable attention. There may be the need for setting and monitoring technical tuning parameters as well as functional configuration. This aspect of administration requires more of a blend of technical expertise and an understanding of the capabilities of the system, the requirements of library personnel, and many other aspects of its operational use.

The shift from a local installation to vendor hosting changes the locus of responsibility for many of these layers of technical activity. In most cases, the vendor or hosting provider will assume operational responsibility for hardware, the network, the operating system, the database, and disaster planning and recovery. The performance of these tasks would be specified in the terms of service language included in the license agreement or contract. These tasks also do not necessarily involve specific library-oriented expertise, but rather are a commodity in the realm of data center operations. Although the execution of these tasks may be performed externally, libraries must remain diligent and ensure that the vendor can demonstrate compliance with required terms of service at each level.

Although the ILS might be seen as the largest and most common example of the trend toward outsourced infrastructure support, almost all other categories of systems have, or will see, similar patterns. Content resources made the shift long ago as CD-ROM networks gave way to web-based resources. Discovery services, library guides, scheduling systems, and almost any other genre of library-oriented software is increasingly only available via software as a service. Libraries involved in technical development are much more likely to use infrastructure as a service from Amazon Web Services or a competing provider than to work with local physical servers. The movement to external and abstract computing infrastructures pervades almost all categories of software, not only within the library, but, in most cases, also throughout its parent organization.

As the library lightens its responsibility for the lower levels of technical infrastructure, it can focus its energy and expertise on the application and presentation layers of its systems. Library technologists can spend their time less on behind-the-scenes infrastructure management, which has little visibility or appreciation by the organization, and more on activities and projects with more direct impact on their fellow staff members or library users.

Some examples of these more library-centered tasks might involve creating customized reports, loading and extracting patron, bibliographic, or financial data, or working with the APIs to implement interoperability with external systems. Such work benefits from library-specific expertise and perspective. Libraries can gain more value from their automation platforms when they can focus their technical talent on optimizing the use of data, refining workflows, and creating efficient connections with other business applications in their organization and with integrating with the platforms or portals of interest to their patrons. Opportunities abound in

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the area of analyzing data to better inform collection development, resource allocation, and other operational decision-making processes.

The ever-decreasing levels of responsibility for technical infrastructure management brings large implications for the skill sets required of systems librarians and other technical personnel within the organization. These in-house technologists will naturally need to evolve their areas of expertise accordingly. Those involved with deeper infrastructure should be able to apply their existing expertise and incrementally gain experience with new tools and technologies at the application and presentation level. They may enjoy working with programming frameworks, such as Ruby on Rails or Python, in conjunction with the APIs of the various automation products to fulfill areas of functionality or interoperability not built in. These examples represent just a fraction of the possibilities open to technical personnel as their world changes around them. Constant refreshing of skills has long been the key survival strategy for the careers of professionals involved in technology.

This trend also means that libraries will evolve the shape of their internal IT departmental staffing. Some may be able to gradually reduce the number of personnel dedicated to technology support. The economics associated with software as a service assumes an all-inclusive license fee in return for lower levels of spending on local infrastructure and related support personnel. Reduced needs for infrastructure support can also translate into more attention to patron-facing and staff-oriented technology as well as new areas of strategic activities, such as support for research data, involvement with scholarly communications, or digital collections. Libraries may want to recruit or cultivate expertise in areas such as user experience, semantic web technologies, and other areas aligned with current or evolving areas of the library's strategic involvement.

Software as a service, vender-hosted systems, and other forms of cloud computing can not only be seen as a trend with strong momentum, but can also be seen as a trend that can mesh well with library priorities. Back-end infrastructure can be seen as a commodity service that can be provided more efficiently, with more security, and with higher reliability through specialized service providers operating large-scale data centers. Libraries can refocus their talents and resources on activities closer to their users and with more direct impact on assisting the work of their staff members. Although there may be negative as well as positive aspects of reliance on external technology infrastructure, the overall impact aligns well with current library strategies and economic realities.

Follett Expands to Dubai

Follett has expanded its international efforts through opening a new office in Dubai in the United Arab Emirates. The office reflects the company's interest in strengthening its business interests in the Middle East region. The Follett International group includes 35 associates, with 8 in the Middle East region. In addition to this new office, Follett has local support in Africa, Asia, the Asia Pacific region, Europe, Canada, Mexico / Central America, and South America / Caribbean.

Follett, which dominates the public school library content and automation sector, has also operated a business unit specializing in the international sector since 2000, according to Steve Siegel, the Senior Vice President of Global Product Management and International at Follett School Solutions. The Follett International business unit has customers in 147 countries globally. Follett International focuses primarily on the top tier of the American International, British International, and International Baccalaureate schools. Siegel reports that Follett serves about 2,000 of the 7,000 international schools globally. These institutions use Destiny or Follett's print or electronic educational content products. Although geographically dispersed, Follett's international business primarily serves schools with English curricula.

Since 2015, Follett has served as the exclusive distributor for International Baccalaureate (IB) publishing products. In addition to IB published products, Follett recently expanded its educational resources oriented to IB schools beyond the products produced by IB itself to include relevant materials from Oxford University Press, Pearson, Hodder Education, Cambridge University Press, as well as SMARTPREP interactive flash cards, Oxford Study Courses, and The Day online subscription news service. All of these materials are available for ordering through Follett School Solutions' Titlewave, which is an educational e-commerce platform.

Follett Corporation ranks as one of the largest businesses globally involved in the library technology sector, with estimated annual revenues at around $2.7 billion with over 10,000

personnel. The company is privately owned by Follett family members. Follett Corporation has recently consolidated its many operating units into two major businesses, Follett Higher Education Group and Follett School Solutions. Follett acquired Baker & Taylor, a major public library book

distributor, in April 2016. Ray A. Griffith serves as President and CEO for Follett Corporation. George F. Coe, who joined Follett as President of Baker & Taylor, serves as Follett Group President. Nader Qaimari is President of Follett School Solutions, reporting to George Coe.

Equinox Shifts to Non-Profit Status

Equinox Open Library Initiative has been established, carrying forward the work of Equinox Software, Inc., to provide services related to open source library software, including the Evergreen ILS, Koha, and the FulfILLment resource sharing environment. This change in status took effect on January 1, 2017. All personnel, assets, and liabilities of Equinox Software, Inc. have transferred to the new organization. Equinox will continue to operate from its existing business location in Atlanta, GA.

The initial version of the Evergreen software was developed in house by the Georgia Public Library System to replace the Unicorn ILS from Sirsi Corporation, which was implemented in 1999 to support the PINES consortium. Development began in June 2004; Evergreen was placed into production in September 2006.

Equinox Software, Inc. was initially established in February 2007 as a for-profit corporation to provide development and support for Evergreen. The company was founded by members of the team that developed Evergreen for the Georgia Public Library System to serve the PINES consortium of public libraries. At the time, PINES included over 252 public libraries in Georgia and has since expanded to 285. Although PINES was one of the first clients for Equinox, they currently operate their Evergreen implementation without external support.

Equinox Open Library Initiative has been incorporated as a domestic non-profit corporation and has applied for, but has not yet received, 501(c) (3) federal tax exempt status. The Board of Directors of the new organization includes the same members as the incumbent company—Mike Rylander, Grace Dunbar, and Jason Etheridge.

Although the organization also works with other software products, support and development of the open source Evergreen ILS has been its core activity. Although supplemented by other organizations and community members, Equinox contributes about 80% of the development of Evergreen. The company employs 17 personnel. Mike Rylander leads the company

as President and Grace Dunbar as Vice President.

Since Evergreen is open source software, Equinox Open Library Initiative works cooperatively with the broader community of library consortia, developers, and other support firms involved with the software. The Evergreen Project (**https://evergreen-ils.org**) partners with the Software Freedom Conservancy for governance support and has established a board to provide guidance and leadership.

The change in business model was made to facilitate new opportunities and to be more consistent with the values of the open source community. As a non-profit, the organization may be more able to attract grants and other funding opportunities. According to Equinox Media Coordinator Mike Rylander: "We have always worked to build partnerships throughout our open source communities, both with synergistic service providers and with users of the software. We strongly believe this change will aid us in further building and strengthening those partnerships, partnerships that will make those user and vendor synergies available to a broader cross-section of the library world."

In February 2014, Equinox launched a new hosting platform, branded as Sequoia, for its clients using Evergreen, Koha, and FulfILLment. Sequoia was designed to provide an efficient, reliable, and secure hosting environment not available from other service providers. (See the February 2014 issue of *Smart Libraries Newsletter* for more details.)

Evergreen was designed primarily for implementation of consortia of public libraries. According to libraries.org, 817 libraries representing 1,559 branches use Evergreen. While the vast majority of these libraries are based in the United States or Canada, Evergreen is also used in Europe and other international regions.

Other non-profit organizations are involved in the support of open source software oriented to libraries and related organization. Lyrasis (**lyrasis.org**), also based in Atlanta, is the organizational hope for ArchivesSpace and CollectionSpace,

two open source projects originally funded by the Andrew W. Mellon Foundation. DuraSpace (**duraspace.org**) is a non-profit responsible for DSpace, Fedora, and other repository platforms. The Open Library Foundation (**openlibraryfoundation.org**) was founded in 2016 as a non-profit to provide a governance environment for open source software projects, initially including FOLIO and the Global Open Knowledgebase. Non-profits are not always tied to open source software. OCLC, also organized as a non-profit, has developed its WorldShare Platform as proprietary software.

System Selection and Implementation Announcements

This section provides a selection of the major procurement announcements made in the last month.

- Tsinghua University in Beijing China will migrate from its current Millennium ILS to Ex Libris Alma. QS World University Rankings places this institution at the top of its overall rankings among universities in China. While Ex Libris has at least 25 libraries in China using its Aleph ILS, this institution is the third to select Alma.
- The Universitat Politècnica de València in Spain will migrate to Alma from its current Aleph ILS, opting to stay with Ex Libris as its automation provider.
- Waikato University Library in New Zealand, which had previously been on track to implement Intota, has completed its implementation of Ex Libris Alma, migrating from its Voyager ILS.
- The Western Suburbs Library Group, including four public libraries outside of Perth, Australia, selected Spydus 10 from Civica to replace their OCLC Amlib ILS.

- A group of three universities—Canterbury Christ Church University, the University of Greenwich and the University of Kent—have selected SirsiDynix Symphony and its BLUEcloud Campus suite for their shared library management environment. These three libraries were previously using separate ILSs (Aleph, Voyager, and Capita Alto). This project stands out as a major affirmation of SirsiDynix in the academic library sector, which has seen Ex Libris and OCLC as the prevailing vendors in recent years. The strategy of moving from separate ILS implementations to a shared system has been a growing trend.
- ByWater Solutions announced several migrations to Koha under its support services, including Mercy College of Health Sciences Library in Des Moines, IA and South Bay Historical Railroad Society, in Santa Clara, CA.

Note that not all vendors issue press releases for each major selection or implementation of their products, so this section should not be considered as a comprehensive listing.

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Smart Libraries Q&A

Marshall Breeding responds to questions submitted by readers. Have a question that you want answered? Email it to Samantha Imburgia, Associate Editor for ALA TechSource, at **simburgia@ala.org**.

With all the consolidation in the industry, what do you think the industry will look like in another five years? Where do you think the innovation will come from? What are the most innovative things you have seen related to library tech? What excites you about the future of the industry? How will artificial intelligence, big data, and the tech titans (Apple, Google, Microsoft, Amazon) affect the future of libraries? Does everyone have to be an IT professional in the future?

This cluster of questions involves a somewhat speculative look forward into the future of library technologies. Although no predictions can be certain, I think that current trends underway provide glimpses into where some of these areas of the library might be going in the next five years.

The history of library automation tells us not to expect radical or sudden change. Libraries and the organizations dedicated to developing technologies for this sector have never executed rapid change. Libraries tend to be adverse to risk and have deliberate, time-consuming decision-making processes. The pace of change has been steady, seasoned with episodic bursts of innovation.

The ILS can be seen as the core strategic technology that has slowly and steadily evolved over its history of about forty years. The ILS has continually gained new capabilities, but has stayed fairly contained within specific confines of functionality. Its roots come from the realm of print, and much of the workflows and metadata structures are well engrained. Public libraries today manage large inventories of physical materials and seem to be generally well served by ILSs, with incremental enhancements to accommodate e-book and audiobook lending services.

Library services platforms represent an innovation in the library technology industry which began five or six years ago. Even after this phase of development and implementation, this genre of resource management infrastructure has advanced considerably, but cannot be regarded as fully mature. The next five years will hopefully see this important new category of library software meet its potential and more fully deliver on their promise to modernize the ways that libraries manage their collections and fulfill access to patrons. This trajectory of development seems lengthy, but, in my experience, there are no shortcuts to creating new technologies able to address the ever-increasing complexity of multi-format library collections with access and lending policies constrained by external legal and commercial forces. The mechanics of managing library collections and operations has become more complex through each phase of its history. But even in this relatively early phase of their product cycle, library service platforms have already had some success in supporting large-scale collaborative partnerships as shared technology infrastructure and to help libraries regain balance in their approaches to the management of electronic and print resources. The concept of the library services platform can be seen as a burst of innovation, which has to be realized though a very long and incremental process of ongoing development and enhancement. *Smart Libraries Newsletter* has chronicled the emergence, development, and adoption of OCLC's WorldShare and Ex Libris Alma as the two library services platforms that have reshaped the landscape of academic library automation. It will naturally be interesting to track the impact of Axiell's recently launched Quria as a new library services platform for public libraries.

Open source software has the potential to spark innovation in the library technology sector. To date, open source applications have been part of the slow and steady path of advancement in our sector. Koha, for example, has seen more than a decade and half of continually improving software and ever-increasing adoption in libraries. The open source Evergreen ILS has likewise provided an alternative in the arena of public library consortia. Both remain viable alternatives for many categories of libraries, and I anticipate ongoing success in the future. So far, however, the open source ILS has not changed the tide of the broader library automation industry, which continues to be dominated by proprietary software. The Kuali OLE project attracted a great deal of attention since its inception in 2008, but ultimately was not able to realize its vision. Today, FOLIO stands as a new approach to open source library service platforms with great potential. It benefits from its ability to tap into current-day technology architectures, agile software development methodologies, and a fresh understanding of library workflow concepts. The project seems to be

gaining considerable engagement with library developers and administrators. It will be interesting to see if FOLIO will see the typical incremental pace of advancement or whether it will spark a new burst of innovation.

Another important trend to watch involves linked data technologies. Interest has been brewing for the last few years. So far, we have not yet reached a tipping point where these technologies explode onto the scene. Rather we have seen a measured roll-out of BIBFRAME, schema.org, and other linked data implementations, with a growing number of implementation examples. It will be interesting to see if the impact spikes once linked data technologies are fully operationalized within core library systems and services. Linked data could potentially be one of the major technologies that reshapes the library technology scene. It represents a movement from protocols and standards invented by libraries and understood and implemented within our domain to a more native or organic adoption of structures and technologies of the broader web.

I see the future of the library technology industry as incredibly interesting and important to the success of our profession. On the business side, the relentless succession of business transactions has reshaped the industry from fragmentation into consolidation. New rounds of consolidation or other business transitions will inevitably take place, and it seems that each new round of change is more profound than the last. The consolidation of the industry has instilled impressive capacity for development in the few remaining vendors at the cost of a much narrower slate of options for libraries. The recent set of changes have placed the library technology industry more directly within top-level companies, providing a range of products and services to libraries, including content, discovery, and resource management. The position of library technology as a more integrated component of the higher-level business ecosystem has both positive and negative implications.

This elevation of the library technologies still remains quite distant from the titans of the global technology realm, such as Microsoft, Apple, Google, and Amazon. I continue to believe that libraries remain fairly obscure relative to the strategies of these companies. I do not anticipate any of them developing products targeting libraries, but rather see library patrons as a segment of their customer base. Amazon, for example, has developed incredibly complex inventory management and e-commerce solutions in support of their own operations. I do not see these technologies as a good fit for libraries, which follow a much different set of fulfillment expectations and embrace almost contradictory values. Libraries exist considerably downstream from these companies that create the core technologies and establish global trends, which, in turn, help shape the directions within our much smaller sector. While the synergies between the global giants may be a bit indirect, they are also incredibly important in shaping the technology ecosystem that libraries inhabit.

The future of libraries will be carried out by librarians, with their special role in society focused on providing access to information and embracing the established values of the profession. Library technologies exist to support librarians and their organizations. While the nature of librarianship may be ever more reliant on technology, I do not necessarily see librarians as having to be information technology professionals to be effective in their work. Successful technologies must be accessible by library personnel without advanced technical training, just as our patron-facing services must be easily understood and used by patrons without explanation or training. Although some librarians may gravitate toward digital and electronic information, I also see this as a relatively small segment of the profession. Some may become experts in using and teaching technology. Many others may use technology to a greater or lesser extent, but remain focused on their domain expertise. The best technology works mostly transparently behind the scenes at the service of individuals and society.

Questions or suggestions for topics in future issues?

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Contact Samantha Imburgia at **simburgia@ala.org**

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