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Smarter Libraries through Technology: Innovative Accelerates its Technology Evolution

By Marshall Breeding

Innovative Interfaces, known for its evolutionary approach of its product development strategy, has begun laying the groundwork for the next phase of its product family, introducing a new multitenant platform that will gradually be phased into parts of its product family. This platform, which it calls the Open Library Stack, provides interoperability among new patron-facing interfaces to Innovative's existing applications. Increasingly, it will be used to deliver the applications themselves. This new platform can be seen as the latest example of Innovative's stepwise moves into new technology architectures, a pattern repeated many times over the company's history. A look at the history of the successive generations of Innovative's products places this into perspective.

The development strategy of Innovative has been one of evolution since the earliest days of the company. This approach has continued even through the changes in management and ownership. Innovative has introduced each new product in a way that retains existing functionality and introduces new technology infrastructure and adapts to current architectures. We can also see a steady progression from entirely closed and self-contained products to increasingly open architectures.

The original product created in 1978 by founder Jerry Kline and Steve Silberstein was a "black box" interface to connect circulation systems such as that from CLSI to OCLC's cataloging service. This product filled an important

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functional need for libraries to avoid re-creating cataloging records that were available on OCLC. Also, it was an important step in integrating modules of functionality that were previously delivered as separate stand-alone systems.

Four years later Innovative introduced INNOVACQ System 100 as a stand-alone acquisitions module running on a mini-computer. Its display terminals provided a text-based interface for library staff to operate the software. An optional serials control module was added in 1985. INNOPAC, introduced in 1987, included a terminal-based online public access catalog to a more complete set of features for technical services, with online circulation capabilities added two years later. INNOPAC had evolved into one of the earliest full-featured integrated library systems and was based on the host-terminal computing model prevalent at that time. INN-Reach was introduced a few years later, based on the development done for the OhioLINK statewide network of university libraries.

The host-terminal model of computing on which INNOPAC was based eventually gave way to the era of client-server computers. Display terminals could display text limited to 80 characters by 24 characters and they depended on mainframe or mini-computer hosts which many organizations were phasing out by the early 1990s. Client-server computing takes advantage of the desktop computers, with processing power rivaling many central computer systems and with monitors capable of supporting graphical interfaces. Operating systems such as Windows from Microsoft and Apple's Macintosh popularized a generation of interfaces allegedly more intuitive than the text menus and command codes of the previous era.

The context of the broader technology shift to client-server computing imposed an expectation in the realm of library automation systems. Sirsi Corporation (now Sirsi-Dynix) launched its new WorkFlows clients for its integrated library system, written directly for Windows. Voyager was a new ILS initially developed as a client-server application with Windows-based clients. Dozens of products were either developed in this architecture or were re-engineered from earlier systems. Though most relied on Microsoft Windows for their graphical clients, others, especially those used in K-12 schools, were written for Apple computers.

Innovative, not wanting to be directly tied to either Microsoft Windows or Macintosh OS, opted to write the staff client software for its new Millennium ILS in Java, a cross-platform enterprise programming language, not to be confused with JavaScript, a scripting language for web browsers. Millennium was announced in 1997, with each functional module released over the course of the next few years. Innovative made the transition to Millennium, preserving most of the core business logic programmed into the INNOPAC server component and separating out the presentation of interfaces into the Java modular staff clients. This approach both saved the company from having to re-develop the functionality of INNOPAC and made for a gradual transformation into the realm of graphical clients. Developing the Millennium staff modules in Java rather than native Windows applications was a forward-looking choice. In the library software industry, most client software at the time was developed for Windows. Java gave Innovative flexibility in respect to the computers that library personal could use with Millennium, but imposed a fairly heavy burden in terms of hardware requirements.

The era of client-server computing eventually waned and was supplanted by services-oriented architecture, web-based computing, and cloud computing technologies. In many areas of business and consumer software, the need for software installed on individual computers gave way to services accessed entirely through a web browser. The server components related to functionality and data management were deployed on software created for a highly distributed environment.

Innovative made its initial foray into a new generation of technology through Sierra, which introduced a new architecture surrounding the functional logic of the Millennium codebase. The functional capabilities of the software had increased through constant development. Consistent with its evolutionary strategy, Innovative encapsulated existing programming around new technical layers. Sierra included new layers of database infrastructure, replacing Oracle and its proprietary transactional database with the open source PostgreSQL and MySQL. New service layers were added to enable the Sierra server to communicate via APIs (application programming interfaces) with new software clients or external systems. Staff functionality was deployed through a new comprehensive Sierra Java client, replacing the modular Millennium clients.

Sierra represents a significant modernization of Innovative's flagship product. While Millennium was essentially a closed system, Sierra follows a services-oriented architecture, designed to more easily participate in a library's overall environment through modern APIs. Its public-facing interfaces did not change substantially, including WebPac PRO and Encore. These products have themselves continued to evolve. With Sierra, Innovative took some steps forward, but also retained some aspects of its client-server flavor. Sierra continued in an architecture oriented toward deployment on institutional servers, though increasingly hosted by Innovative. Libraries or consortia continue to install the Sierra server components individually, in contrast to products such as OCLC's WorldShare Management Services or Ex Libris Alma, where all organizations share the same codebase deployed on a global multi-tenant platform. Sierra continues to use a

Java-based graphical staff client, which must be installed on the computers of library staff members, rather than using web-based interfaces.

Innovative's evolutionary approach is not without its benefits. Libraries moving from Millennium to Sierra have relatively lightweight migration tasks with little need to retrain staff members. Libraries migrating from Millennium to Sierra bear a significantly lower cost relative to purchasing a new product from another provider. The functionality and workflows that Innovative has developed over three decades has been continually enhanced, providing libraries with a very rich and sophisticated automation environment.

The initial release of Sierra also did not completely fulfill the transition to the modern technology architectures of multi-tenant, web-native platforms. Though making substantial progress, Sierra retained installable staff workstation clients rather than web-based interfaces and retained the concept of server-oriented software that must be constantly patched and updated for each installation. This approach appeals to some libraries that may not yet be ready take the full plunge into cloud computing.

Innovative's evolutionary approach to functionality brings both advantages and disadvantages. Carrying forward functionality and workflows through multiple generations of software can result in very detailed and complete capabilities. But this conservative approach can also reinforce workflows that may no longer align with changing library priorities. Developing entirety of a product anew allows for engineering completely new workflows based on a fresh analysis or an ideal view of how libraries can manage and provide access to their collections in the current era. But by carrying forward its functionality through multiple generations of technology, each new product is launched with mature functionality. Innovative has seen an extremely strong response in sales for Sierra, especially from its existing Millennium customers, but also with new customers, demonstrating resonance with its evolutionary approach.

In this issue of *Smart Libraries Newsletter* we take this historic view of Innovative's product evolution into the present. The company has recently announced its Open Library Stack as a new cloud platform and an initial set of products based on its services.

Innovate Introduces Open Library Stack

Today's prevailing technology architecture is loosely called cloud computing. More specifically, modern software is designed for web-based interfaces and deployed on computing infrastructure residing in remote data centers. Any application intended for large-scale use, such as consumer or business software or social networks, will be deployed on a multi-tenant platform, where a single instance of the code base, operated on a distributed cluster of computing and storage devices, supports all its personal or institutional implementations. Facebook, Gmail, or Salesforce exemplify web-native, multi-tenant platforms that support millions—or billions—of users on a highly scalable platform. As the prevailing computing architecture, any major application created anew would be developed and deployed in this way.

Multi-tenant services have been created in the library technology environment, such as OCLC's WorldShare Management Services, Biblionix Apollo, and Ex Libris Alma. But in an industry where products can have a lifespan of multiple decades, opportunities to build from scratch according to current technology paradigms are rare. Many companies opt to evolve their products rather than start over in each phase of computing.

Innovative, as one of the longstanding companies in the industry, has faced the need to take its products forward through multiple generations of technology and has consistently followed an evolutionary approach. Sierra, one of its flagship automation products, can be characterized as an evolutionary product with flavors of a services-oriented architecture and remnants of its client-server legacy. In some aspects it functions as an integrated library system, but also is positioned as a library services platform.

In parallel to its existing suite of evolved products, Innovative has also initiated development of new technology infrastructure deployed as a multi-tenant platform. Dubbed the Innovative Open Library Stack, this platform provides a growing set of services that will become the basis of its new product development strategies. Development of the platform began in 2015. As implied by its name, this new platform is based on multiple layers of software. Some of the initial applications rely on the Open Library Stack to provide modern interfaces and functionality that tie into existing products. Future products will be deployed entirely within the environment.

The Open Library Stack includes a central layer called Shared Platform Services. Each of these services is invoked via APIs (application programming interfaces). Requests may

come from a variety of entities, including mobile apps, client software, or any other external program. These API requests may be resolved by business logic and data entirely resident on the stack or through an instance of one of Innovative's traditional applications. An API request for a user login, for example, might be initiated through a mobile app, then address the Authentication Service on the Open Library Stack, which in turn will issue its own request to a specific library's instance of Sierra via its Patron API. Innovative positions this platform as a shared-services cloud that can create high-performance interoperability among any of its products or with external clients or business applications. This environment has been designed to operate with some data stores managed as multi-tenant to serve all users, such bibliographic data from SkyRiver or its new central e-resource knowledge base. The platform also manages access to data resident in specific instances of its server-oriented application.

The current set of Shared Platform Services includes:

- Authentication Service
- Settings Service
- Configuration Service
- Application Services
- Linked Data Metadata Service
- Central Catalog Knowledgebase Service
- Technical and Public Event Services

Innovative has deployed its Open Library Stack through infrastructure providers such as Amazon Web Services and Microsoft Azure. These well-established global providers enable Innovative to activate services across multiple regions to support its global customer base. The software's architecture and the cloud infrastructure provide the capability for highly-redundant, scaleable, and secure services.

Mobile Worklists

Innovative created Mobile Worklists as the first application based on the Open Technology Stack. This application provides a very simple set of functions, but exercises the capabilities of the new platform. Mobile Worklists enable library staff to record lists of items using a smartphone or tablet. The lists can be uploaded and processed within Sierra. Creating lists is one of the most popular features for manipulating records in Sierra and is used for reporting, record updates, or any other task that involves batches of records. The Mobile Worklists app, for Apple's iOS, is intended to provide a convenient way to perform routine tasks taking advantage of mobile devices, such as recording items consulted but not checked out, identifying candidates for weeding or transfer, materials needing repair, or other scenarios. Once the app is installed on a mobile device, the staff member signs in with the same credentials as would be used directly with Sierra. The Mobile Worklists app sends a request to the Authentication Service on the Open Library Stack, which in turn sends a request to the appropriate instance of Sierra. The app uses the camera of the mobile device to scan barcodes. The app can collect multiple lists, which when complete can be uploaded into Sierra for processing. Innovative recently released an updated version with the ability to send lists by e-mail and to format them as delimited files, which can be opened in spreadsheets or other applications.

MyLibrary! New Mobile App for Patrons

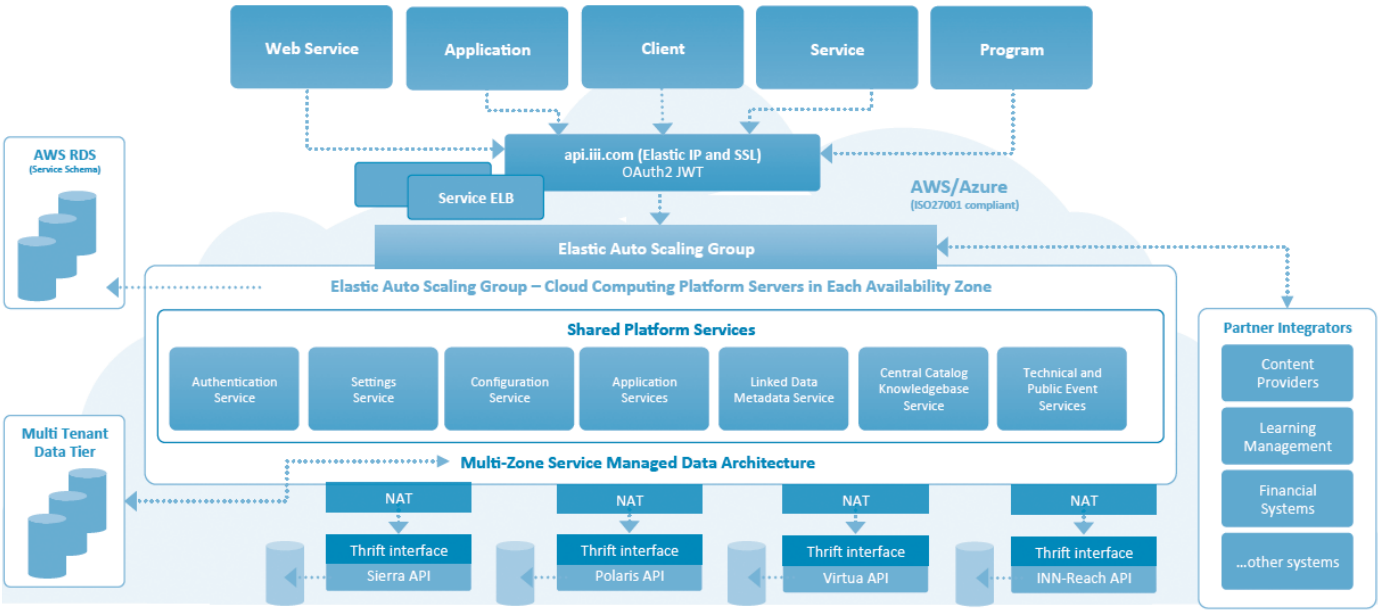
In March 2016 Innovative released a new mobile app for library patrons branded as MyLibrary!. Based on the Open Library Stack, the app includes a standard set of features of interest to library patrons, including searching the library catalog for both print and electronic materials through keyword search; display of items with real-time availability status; viewing account profile information, items checked out, outstanding fines; and placing holds on items. Patrons can check out and download available e-books from the library's titles provided through OverDrive or Bibliotheca Cloud Library. Using the device's camera, a patron can scan the ISBN barcode of an item to check to see if the item is held in the library. The app also displays social media streams from the library from Twitter, Facebook, and Pinterest. English and Spanish interfaces are offered.

The initial version of the app, available in iOS from Apple's App Store features Innovative's branding, though future versions will also be available with library branding. The app is not available for Android. New features anticipated for future releases include self-service checkout when visiting the library and notifications for items due, overdue or newly received by the library within areas of interest.

The new MyLibrary app from Innovative provides a very basic set of features that a library would expect in a mobile app for their patrons. While the features themselves are not earth-shattering, its deployment through Innovative's new Open Library Stack architecture is more notable. Innovative also offers the mobile version of its Encore discovery environment, directly addressing a library's Sierra server and predates the Open Library Stack infrastructure.

Innovative has a long history of involvement with mobile applications, initially introducing AirPAC in 2001 for PDA (personal digital assistants), the precursor to smartphones. The early version of AirPAC was modeled after Innovative's WebPAC, but accommodating small devices. AirPAC for

Technical Overview of Open Library Stack



Smartphones for the iPhone and Blackberry Storm was introduced in January 2009 with a more modern interface and using the RightResult technology for search results. AirPAC is no longer developed, displaced by Encore Mobile and MyLibrary!. (See "Decade of Mobile at Innovative" *Smart Libraries Newsletter*, March 2010.)

INN-Reach for Polaris

Innovative has also leveraged its Open Library Stack to extend the interoperability of its venerable INN-Reach resource sharing environment. INN-Reach provides a union catalog and direct consortial borrowing functionality for libraries using a distributed ILS configuration. INN-Reach enables patrons to search for materials in a catalog representing the holdings of all the participants and place requests of items of interest, which are then routed from the owning institution to the home institution of the borrower. INN-Reach was originally developed for the OhioLINK consortium of academic libraries in Ohio in the mid-1990s and was implemented by the Orbis consortium in 1997. The product was originally limited to providing a distributed consortial borrowing environment for groups of libraries where all members had implemented Innovative's own ILS—INNOPAC at the time, but subsequently Millennium and Sierra. The interactions between the INN-Reach system and the ILS were managed through proprietary mechanisms. In response to interest for this functionality for libraries using another ILS, support was added for other vendors' products using supplemental software called a Direct Consortia Borrowing broker, or DCB. The DCB broker, implemented as a subset of a Millennium ILS, translates the NCIP messages from a non-Innovative ILS into the native format of INN-Reach. DCB adds both cost and complexity to a resource sharing environment.

Innovative has recently leveraged its Open Library Stack to obviate the need for DCB when a library using Polaris participates in an INN-Reach network. Rather than using a standalone DCB, this new configuration relies on services residing on the Open Library Stack to translate messages between Polaris and INN-Reach. The Open Library Stack includes interfaces that interact with the APIs exposed by each of Innovative's major products, including Sierra, Polaris, Virtua, and INN-Reach. Since both Polaris and INN-Reach already have API interfaces into the platform, the DCB hardware and software can be eliminated, with the message translations implemented as a service.

The Colorado Alliance of Research Libraries has used INN-Reach since 2001 to provide resource sharing for its member libraries. DCB had been implemented to support libraries using non-Innovative ILS products, such as the Denver Public Library, which implemented Polaris in 2010. The Alliance has been involved in the beta testing of this new configuration, which significantly simplifies the technical overhead of an INN-Reach configuration with Polaris. ILS

products outside the Innovative product suite will continue to need the DCB broker.

Sierra Release 2.1

The latest version of Sierra, Release 2.1 also takes an incremental step into current technology architectures. Sierra was initially delivered as Java-based clients, requiring installation on the computer of each staff member. This version of Sierra makes a partial transition to web-based interfaces. Innovative has included in this version the Sierra Web Application, providing web interfaces for a subset of functions related to circulation. This initial set of tasks do not involve patron check-outs, such as item returns, renewals not requiring a patron ID, incremental use counters of an item, and searching holds. These initial features available through the web interface do not yet replace the Sierra Java client required for the full set of patron interactions that take place at library service desk. Rather, they provide a sampling of functionality to introduce the new interface to circulation personnel until the more complete circulation client is released. The web interface extends the technology developed by Polaris to create a new set of web-based interfaces called Leap for the Polaris ILS.

This latest version of Sierra also includes a new package of RESTful APIs providing access to Sierra data and functionality of interest to academic libraries. These new APIs, for example, enable a library to provide access to e-reserves materials through the institution's learning management system.

Each of these three products, Mobile Worklists, MyLibrary!, and the INN-Reach extension for Polaris and the Sierra Web Application, is a relatively minor product that might not otherwise rise to the level of news coverage. The significance lies more in the transition Innovative has made toward developing a platform based on current architecture. With this new platform now available as a foundation, Innovative is positioned to accelerate the evolution of its broader product line to meet expectations for web and mobile interfaces and cloud-oriented architecture.

SirsiDynix Announces BLUEcloud Acquisitions

SirsiDynix has been undertaking a strategy to modernize its product suite since 2013 through a new platform and set of web-based interfaces branded as BLUEcloud. This strategy takes a hybrid approach of deploying new applications and interfaces via a modern multi-tenant platform even as libraries continue to use one of the SirsiDynix ILS products, Symphony or Horizon. (See *Smart Libraries Newsletter*, May 2013 and August 2014.)

Some of the BLUEcloud modules previously released include:

- BLUEcloud Cataloging, released in 2014, has been implemented by more than 300 libraries.
- MobileCirc, offering selected circulation functions through a mobile interface optimized for smartphones or tablets.
- eResource Central, a product to manage the acquisition and delivery of e-books and other digital content.
- BLUEcloud Circulation, in development and planned for release in 2016.
- BLUEcloud Analytics, replacing two earlier products oriented to statistics and reporting, Directors Station and WebReporter. Released in 2014, it has been implemented by 225 libraries.
- BLUEcloud Visibility, released in 2015, provides a service developed in partnership with Zepheira to expose library collections as linked data to facilitate discovery on the web by Google and other search engines.
- BLUEcloud PAC, a web-based online catalog intended to replace earlier products such as eLibrary, iBistro/iLink, and HIP.
- Enterprise, a full discovery interface with faceted navigation and relevancy-based results.
- BLUEcloud eRM, an electronic resource management system based on the open source CORAL software originally created at the University of Notre Dame, entered testing as a pilot release in February 2016.

Adding to these modules, SirsiDynix has announced its progress in the development of BLUEcloud Acquisitions. This module has been created in partnership with the South Australia Public Library Network, which had created its own acquisitions system that was in service for the past two decades. SAPLN, which includes all of the public libraries in the state of South Australia, has implemented SirsiDynix Symphony as a shared system for all its members.

BLUEcloud Acquisitions will manage the selection and procurement of library materials, whether made centrally through the network office or by the local library. The module will include standard acquisitions functionality, such as budgeting of collections funds, invoice processing, and collection

development support. A set of workflows will be available to optimize processing in large library systems or consortia. BLUEcloud Acquisitions will operate in conjunction with both Symphony and Horizon and is expected to be implemented for SAPLN later in 2016 with general availability to follow.

Through the creation of the BLUEcloud platform, SirsiDynix has been able to embark on an ambitious path to providing web-based interfaces and new functionality without forcing libraries using its Symphony or Horizon ILS products into a disruptive migration process. Most data continues to reside in the ILS, even as interfaces and functionality shift to the BLUEcloud products. For new clients, SirsiDynix offers a hybrid model of Symphony and the available modules of the BLUEcloud platform. SirsiDynix reports that more than 1,700 of its library customers have implemented at least one of its BLUEcloud products.

Library Technology News

Zepheira and Innovative Announce Partnership in Delivering Linked Data Services to Libraries

16 March 2016 – Zepheira announced a new joint partnership at the Innovative Users Group Conference (IUG 2016) in San Francisco, which promises to streamline the adoption of Linked Data in Innovative's Library Customers.

Innovative's new service, Innovative Linked Data, leverages the value of existing metadata within the library catalog and resource management system to raise the profile of libraries in web and mobile interactions. It makes use of Zepheira's transformation and publishing technologies to transform any library's existing catalog and reveal it to the Web using Linked Data vocabularies including BIBFRAME.

Innovative credits the development of the new product in part to the active leadership from its own library customers in the Libhub Initiative working with Zepheira, including

- Arapahoe Library District, Colorado
- Barrington Area Library, Illinois
- Cuyahoga County Public Library, Ohio
- Dallas Public Library, Texas
- Denver Public Library, Colorado
- Evansville Vanderburgh Public Library, Indiana
- Hamilton Public Library, New York
- Mohawk Valley and Southern Adirondack Library Systems, New York
- Multnomah County Library, Oregon
- Phoenix Public Library, Arizona
- Qatar National Library, Qatar
- Salt Lake County Library Services, Utah
- Sno-Isle Libraries, Washington
- Suffolk Cooperative Library System, New York
- Tulsa City-County Library, Oklahoma
- Worthington Libraries, Ohio

ProQuest launches Ebook Central

MOUNTAIN VIEW, CA, 15 March, 2016 – ProQuest launched its highly-anticipated ProQuest Ebook Central today.

At the core of Ebook Central is its selection of authoritative, scholarly content—790,000 titles and 1,350 imprints from more than 650 publishers on one platform. An average of 100,000 newly published titles will be added each year.

The content is backed with an administrative and acquisition engine—LibCentral—that simplifies librarian workflows with multiple models—including DDA, STL, outright purchase, non-linear lending, among others—that enable librarians to customize according to their budget requirements. LibCentral's easy and reliable collection management and assessment tools—with flexible administrative controls and built-in interoperability with key vendors—eliminate redundant and tedious tasks, enabling librarians to do more in less time.

Users can read online or take advantage of offline reading options including DRM free chapter downloads and full book downloads. Support for mobile devices is offered via a responsive web design that optimizes heavily used features such as search and download on tablets and smartphones.

A variety of libraries have gone live on Ebook Central, and the balance of ProQuest's ebrary and EBL customers will be upgraded to the new experience over the next year.

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