

A framework for planning shared library services

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1. Introduction

Historically, libraries have taken sole responsibility for most of the services they offer. The exceptions to this rule have been interlibrary loan and shared (or union) cataloging. Libraries commonly require these services, but they cannot independently afford them. As a result, these services have been mounted as shared or utility services by third parties (e.g. OCLC) or library cooperatives (e.g. the University of California's Department of Library Automation).

The development of digital libraries has precipitated growth in the number and range of shared library services that are supplied by third parties. In a networked information age, a library can give patrons access to content and services without actually hosting the content or the services on site. The economies involved in subscribing to and using shared services can be substantial - the library is saved the cost of having locally to build and maintain the deep technical infrastructure these services require.

Most shared digital library services are highly centralized, and typically offer a one-size-fits-all solution. They save libraries costs, but also diminish their ability to configure services to meet local needs. In addition, some central services hide the library's historic role as an organization that mediates between patrons and a world of information. Regular readers of online IEEE and AAAS journals, for example, may have no idea that the access they enjoy to these journals is actually secured for them by their library. In the past few years, we have heard a great deal about a new "layered" service model.¹ This model would have libraries building highly customized local services on the base centralized services managed by third parties. The service model promises the same degree of flexibility, innovation, and customization that is associated with local service provision without sacrificing the economies that are achieved through the shared centralized model. It also promises to strengthen the library's historic and essential mediating role between users and the information they seek.

The following is a brief review of the various models of library services, outlining their distinctive strengths and weaknesses, and indicating where they may be most

¹ The greatest push is coming from so-called web services. See Clay Shirky, *Planning for Web Services: Obstacles and Opportunities* (April 2002) from <http://webservices.xml.com/pub/a/ws/2002/04/12/excreport.html> but the layered service model is not at all unknown amongst digital libraries. See Andy Powell, Liz Lyon, "The DNER Technical Architecture: scoping the information environment" (May 2001), from <http://www.ukoln.ac.uk/distributed-systems/jisc-ie/arch/dner-arch.html>. It is also very apparent in work on instructional technologies. See "IMS Digital Repositories Interoperability - Core Functions Information Model Version 1.0 Final Specification" from http://www.imsproject.org/digitalrepositories/driv1p0/imsdri_infov1p0.htm. Also see Scott Thorne, Chuck Shubert, and Jeff Merriman, "O.K.I. Architecture Overview", from http://web.mit.edu/oki/product/whtpapers/arch_overview.html

appropriately applied. The intention is to assist the UC libraries in planning for new shared services and in planning for the continuation and maintenance of existing ones.

2. Service description and characteristics

2.1. Local services. Any discussion of shared library services needs to begin with local services, since shared services only make sense where local ones do not.

With local services, the library very visibly maintains responsibility for service development and delivery. Local services are entirely customizable. They are designed, constructed, and delivered by the library to meet its patron's distinctive needs. Local services are also entirely paid for by the library.

Historically, libraries have taken sole responsibility over most of the services they offer, and this has been the case with online services as well. In this networked age, digital library services are appropriately supplied on a local basis where:

- ❑ All or most service inputs (technologies, personnel, information content) are readily available onsite.
- ❑ Local needs are either unique, or immediate or rapidly changing and so cannot be met in a timely fashion by a central or shared service.
- ❑ Technologies are experimental and not pervasive.
- ❑ A key aim in providing the service is to gain competence in some aspect of its development or delivery.

All of the UC libraries provide key online services on a local basis. At a minimum, they develop and maintain:

- ❑ Online catalogs that reflect local holdings and circulation data, which are essential for bibliographic management.
- ❑ Library websites, which provide a highly distinctive and rapidly evolving service that relies almost entirely on local inputs.
- ❑ Collections of distinctive online materials that are purchased or created locally or in combination with other organizations, but not as part of a UC systemwide effort.

In addition, some libraries are actively involved in the development of new and innovative online collections and services, some of which have potential systemwide implications.

2.2. Centralized services. Here, responsibility for service development and delivery is located in a single organization. The UC libraries benefit from a range of centralized services. Responsibility for these services is distributed across the system. For example, Berkeley manages the NRLF and is helping to develop systemwide digital preservation capacity, while the CDL manages Melvyl and other digital library services, and San Diego hosts systemwide acquisitions.

Where digital library services are concerned (e.g. those at CDL), the UC libraries have a considerable say in service design. Still, once the services are designed and implemented, they do not provide for significant local customization.

Examples of central digital library services are supplied in the table below with an indication of how the services are funded and the level of campus-based customization they permit.

Service	Primary sources of service funding	Additional sources of service funding	Level of campus-based customization
Melvyl	<ul style="list-style-type: none"> ❑ CDL supports and maintains the union catalog, including the data processing required to input campus data, the user interface, backup and recovery, etc. 	<ul style="list-style-type: none"> ❑ Campuses create and supply bibliographic records. ❑ Resource sharing and CDL funds have been used for campus record improvements. 	None
Shared content	<ul style="list-style-type: none"> ❑ Campus co-investment in subscription. ❑ CDL funds facilitate resource selection, negotiation, acquisitions, and licensing. CDL also supports development work that improves or tailors access services as required. 	None	<ul style="list-style-type: none"> ❑ Campuses work individually and in small groups to purchase electronic resources that are not acquired as part of the shared collection.
OAC	<ul style="list-style-type: none"> ❑ CDL supports and maintains the union catalog, including the data processing required to input campus data, the user interface, backup and 	<ul style="list-style-type: none"> ❑ Campuses undertake creation of online finding aids and submit these to the CDL in a standard, conformant way. ❑ The California State Library, the NEH and other funding 	None

	recovery, etc.	agencies have supported work that has contributed to OAC.	
EScholarship repository	None
Counting California	None
UC Press editions	None

2.3. Customizable central services. As the name suggests, these services are provided centrally but can be customized by the central service provider to meet local library's distinctive needs. Customization certainly overcomes the limitations inherent in the one-size-fits-all approach. At the same time, it is essentially *ad hoc* and can be expensive. Further, customizable central services are surrounded by uncertainty. It is not clear, for example, what service functionality should be considered core and available to all libraries at no additional cost, and what should be considered *ad hoc* and available to only to libraries that request it. Nor is it clear how customization work should be paid for - should it be paid for by the library that requests it or by the central service provider?

Perhaps as a result of the uncertainty that surrounds customizable central services, the UC libraries do not have extensive experience with them. Searchlight is probably the closest thing we have to a customizable centralized service, and that service does not have a great deal of library or even user satisfaction. Occasionally, aspects of our work on Melvyl inclines toward the customizable – notably, where CDL pays for improvements of or modifications to bibliographic records.

2.4. Layered services. Here, libraries take responsibility for building local and highly customized services based upon service components that are made available by a number of different organizations.

The UC libraries have very limited experience with these layered services. The only current viable example is UC-eLinks – the service that allows users to move seamlessly from a citation (as may be discovered in an online reference database or online journal) to the underlying full text of the cited article. In the initial thinking about this service, both the local and centralized service models were effectively ruled out.

The centralized model was ruled out because if it was supplied as a one-size-fits-all solution, it could only link electronic journals and reference databases available in the shared collection. The problem is that campuses have significantly more electronic journals and databases than are represented in the shared collection. As a centralized service, UC-eLinks would not adequately represent any campus's digital holdings.

The local service model was also ruled out because of the redundant costs involved developing and maintaining numerous SFX servers (the technology that drives the linking).

The service model that eventually emerged was a layered one. The CDL maintains a single SFX server and ensures that it links the reference databases and journals in the shared collections. Campus libraries configure the service for local implementation by including locally held online materials.

The digital preservation program may also develop as a layered service. At least, one can envisage a scenario in which the CDL takes responsibility for:

- a) preserving the digital information whose persistent management is required by all campus libraries (e.g. online materials that make up part of the shared digital collection)
- b) providing campuses with the tools, services, and the access to deep technical infrastructure that will enable them at a substantially reduced cost to persistently manage those digital assets in which they are uniquely interested.

Thinking at the CDL about revisions to the Searchlight service also points to a layered model. Searchlight is, in effect, a portal service that integrates access to a variety of different collections. As a central service, it can only open out onto information that makes up the shared collection. A more effective service model sees Searchlight as a service that campus libraries use to build portals that suit their own needs. In this regard, Searchlight2 becomes a tool that campuses use to integrate shared and local holdings, and to develop portals for specific subjects or formats.

The layered service model also promises to make more effective use of campus-based digital library resources. In the layered service examples given above, the common service components (SFX server, preservation capacity, portal development tools) are built by and located at the CDL. This needn't be the case universally.

Figure 1 shows how the model may be conceived of more generally. The figure depicts three digital object repositories, or collections. The collections could comprise encoded texts, digital images, research publications (e.g. in pre-print servers or institutional repositories), sound recordings, archival finding aids, maps, or data. These repositories needn't be managed by the CDL, they could be at other UC libraries, or they could even be managed by non-UC libraries, by publishers, by research institutions, or by companies working in the entertainment industry.

In a layered service environment, users can browse, search, and display the content of each of these repositories by visiting its website. Users can also build "higher-level services" based on the digital objects (the encoded, texts, faculty publications, digital images, sound recordings, etc.) that the repositories contain. Higher-level services can use some or all of the digital objects within one or more of the repositories. Thus, a higher level service supporting study of the "American west" may refer to some objects in several underlying repositories, such as digital images of the west from an image

repository, publications about the west from a pre-print server, encoded texts of works of western authors from the text repository.

Some higher-level services will be built directly on top of the repositories:

- ❑ A subject portal, that allows users to search seamlessly across selected objects in underlying repositories. Users could view publications, research, and digital images on a subject as a single database drawn from the underlying repositories.
- ❑ An archives portal that integrates access to online finding aids developed and maintained by hundreds of libraries, archives, and special collections.
- ❑ An alerting service that notifies individual end users about additions to and deletions from repositories. Here, end users sign up indicating that they are interested in works about or by Ansel Adams and are notified whenever such works are added to any of the underlying repositories.
- ❑ A print-on-demand and PDA delivery service that reformats document-like objects from underlying repositories (where they may be stored as encoded texts, as page images, or as Quark files) and delivers them to a user's PDA or to a local print-on-demand service that creates a perfect bound, low-cost paperback edition.

Some higher-level services will be built on top of services that mediate or shape interaction with underlying repositories. For example, authentication and commercial transaction services might intervene between the print-on-demand and PDA delivery service, and the repositories that it is built upon. This would ensure that only fee-paying customers would be able to print or deliver to their PDA's the electronic editions of books and articles found in the underlying repositories. The figure also shows some other services that require three or more service strata:

- ❑ Online learning materials that are created with and managed by a course management system that interacts directly with several repositories.
- ❑ A union catalog of regional archives that selects online finding aids from the portal that pertain to the holdings of some 50 or 60 regional libraries, archives, and special collections. The union catalog also interacts with a controlled vocabulary that may be developed and maintained by OCLC, RLG, the Library of Congress, or the Getty Information Institute. The union catalog has a greater level of functionality than the archive portal. It refers exclusively to holdings in a particular region and has enhanced search capabilities because the finding aids themselves are normalized through the application of a controlled vocabulary.

The layered service model has enormous potential:

- ❑ Library collections can be substantially enhanced.
- ❑ Library services can be tailored explicitly to meet local user's needs. Thus, a library builds services that integrates a world of information with its own local and distinctive collections, and presents the body of material in a way that supports and reflects local research and teaching needs.

- Just as libraries benefit more from the holdings managed by others, they benefit as well from third party services. Thus, a successful alerting service developed by one institution to inform users about new materials having to do with thermonuclear dynamics, may be readily adapted at another institution to inform its users about advances in human genome science.

It encourages exploration of different sustainability options because the model does not constrain the business decisions that need to be made about any service at any layer.

- It does not constrain participation. Digital object repositories needn't live exclusively at libraries. Similarly, libraries needn't have any monopoly over the higher-level services that could also be developed by the Corporation for Public Broadcasting, Disney, and Thompson Inc.

There are, of course, numerous practical questions surrounding the layered library service model:

- What characterizes an open digital object repository? Rather, how do we build repositories (and digital objects within them) so they can support construction of higher level services, many of which we cannot possibly predict?
- What are the minimum requirements that apply to other lower-level services (such as authentication, controlled vocabulary, commercial transaction processing) that enable higher-level services to be reliably constructed on top of them?
- What network and other protocols are required to ensure appropriate interchange between repositories and the services that are built on top of them?
- What incentives will attract institutions to participate? What are the incentives for those participating who supply services that don't interact directly with individual end users (for example, the digital object repositories)?

The layered service model also poses interesting questions to the UC libraries, notably about their respective roles and responsibilities. It suggests an interesting discussion that will:

- Help to distinguish infrastructural or lower-level services from higher-level end-user ones.
- Help to determine the preferred locus of responsibility for delivering customized and locally tailored higher-level tools and services.
- Help to determine the preferred locus of responsibility for essential utilities upon which higher level services may depend.