Smarter Balanced Digital Library (RFP 23) Technical Systems Documentation

Prepared for:

by:

Revision History

Version	Date	Author(s)	Description
1.0	2014 08 12	Stanley Chung	Template draft
1.1	2014 08 20	Brandon Tate	Content Updates
1.2	2014 08 27	Brandon Tate	Content Revisions
1.3	2014 09 12	Stanley Chung	Content Revisions
1.4	2014 09 15	Frank Walsh	Content Revisions

Review History

Date	Reviewer(s)	Description
2014 08 25	Frank Walsh	Content and Technical Review
2014 08 27	Stanley Chung	Formatting and Clean-up
2014 09 05	Brandt Redd	Review and Feedback 1
2014 09 05	Mike Powell	Review and Feedback 1
2014 09 24	Brandt Redd	Review and Approved (as of Release 1.35)

Acronyms List

Table 2: Acronyms List

Acronym	Definition
DL	Smarter Balanced Digital Library
CCSS	Common Core State Standards
SDLC	System development life cycle
AWS	Amazon Web Services
API	Application Programming Interface
ProgMan	Shared Services Program Management Component
SSO	Shared Services Single Sign On
LRMI	Learning Resource Metadata Initiative
SSH	Secure Shell
UI	User Interface
SAAS	Software as a Service
IDP	Identity Provider
IaaS	Infrastructure as a Service
LRI	Learning Registry Index

1. Introduction

1.1 Purpose

This document outlines the infrastructure, technology and data model used to build the Digital Library. Functionality requirements are also listed in Section 4 along with relevant screens and the applicable functionality to satisfy the requirements.

1.2 Scope

This document covers the entire functionality of the Digital Library 1.4 release. The applicable requirements are listed in Section 2 of this document.

1.3 Resources

1.3.1 Digital Library Requirements

Requirements assigned to the CMS and then elaborated with the Smarter Balanced Consortium. These will be delivered to the Smarter Balanced Project Management Partner (PMP) for archival purposes.

1.3.2 Pivotal Tracker

The DL team managed development of the Digital Library using Pivotal Tracker:
https://pivotaltracker.com

1.3.3 Document Maintenance

This document will be updated as needed, as the project proceeds through each phase of the system development life cycle (SDLC). This document contains a revision history log located directly after the table of contents. When changes occur, the document's revision history log will reflect an updated version number as well as the date, the owner(s) making the change(s), and a description of the change(s). The version number will follow the following guidelines:

Table 2: Version Change Guidelines

Change Type	Version Update ("#" reflects change)	Description
Major	#.1	Major changes will be recorded when this document is used for a different deliverable (i.e. LRN Conceptual Design Part 1 and Part 2).
Minor	1.#	Minor changes will be recorded when sections are significantly changed or completed.

2.   Technical Overview

2.1 Overview

The Digital Library provides users with the ability to find and use professional learning resources and instructional resources to tailor Common Core instruction to students' needs using the formative assessment process. In addition, it provides the ability for authorized users to publish, organize, and find content – as well as engage in community activities based on their membership and role.

2.2   Key Software Components

The Digital Library site will be deployed on Acquia Managed Cloud. All Acquia environments are deployed on Amazon cloud services utilizing Amazon's IaaS and allowing for dynamic scalability based on load requirements. Acquia provides monitoring services (via New Relic) and 24/7 support to system administrators. The dynamic nature of the deployment on Acquia allows for scalability of the CMS, the scalability of the CMS, which includes a persistence API and the SOLR index, which is responsible for the internal search functionality of the site.

Major hardware and software elements include:

Table 4: Hardware and Software Elements

Capability	Specification	Provider	Vendor	Vendor Product	Tenancy
Platform Management	Amazon Web Services (AWS) Acquia New Relic	Acquia	Amazon New Relic	Acquia Cloud New Relic	Subscription
Web and Application Server	AWS Apache 2.2.14	Acquia	Amazon	Acquia Cloud	Subscription
CMS	Drupal	Acquia	Acquia	Drupal 7	Dedicated
Load Balancer	NGINX and Varnish	Acquia	Acquia	Acquia Cloud	Subscription
Database	MySQL v.5.5	Acquia	Amazon	AWS RDS	Shared
Guest OS	Ubuntu 12.04 LTS	Acquia	Amazon	Ubuntu Cloud Server 12.04	Dedicated

Hardware Elements Diagram:
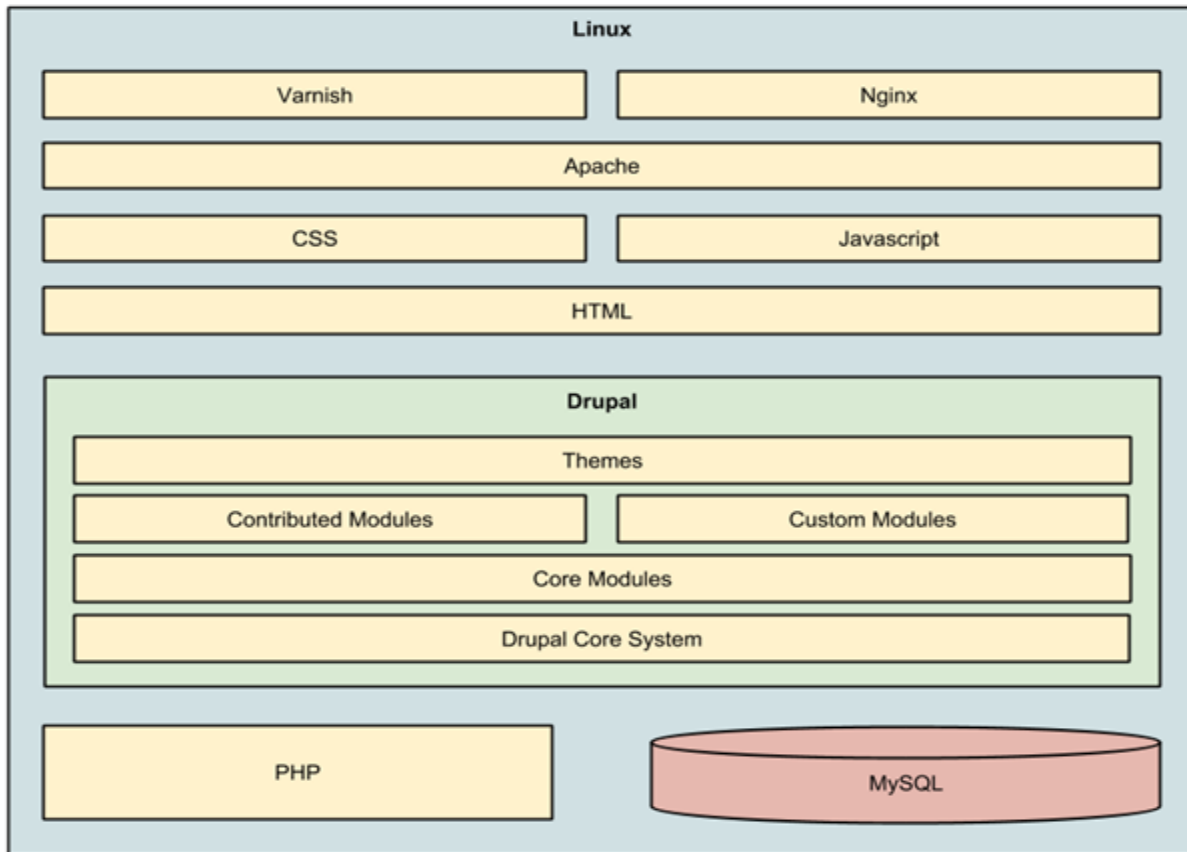
Hardware Flow Diagram:
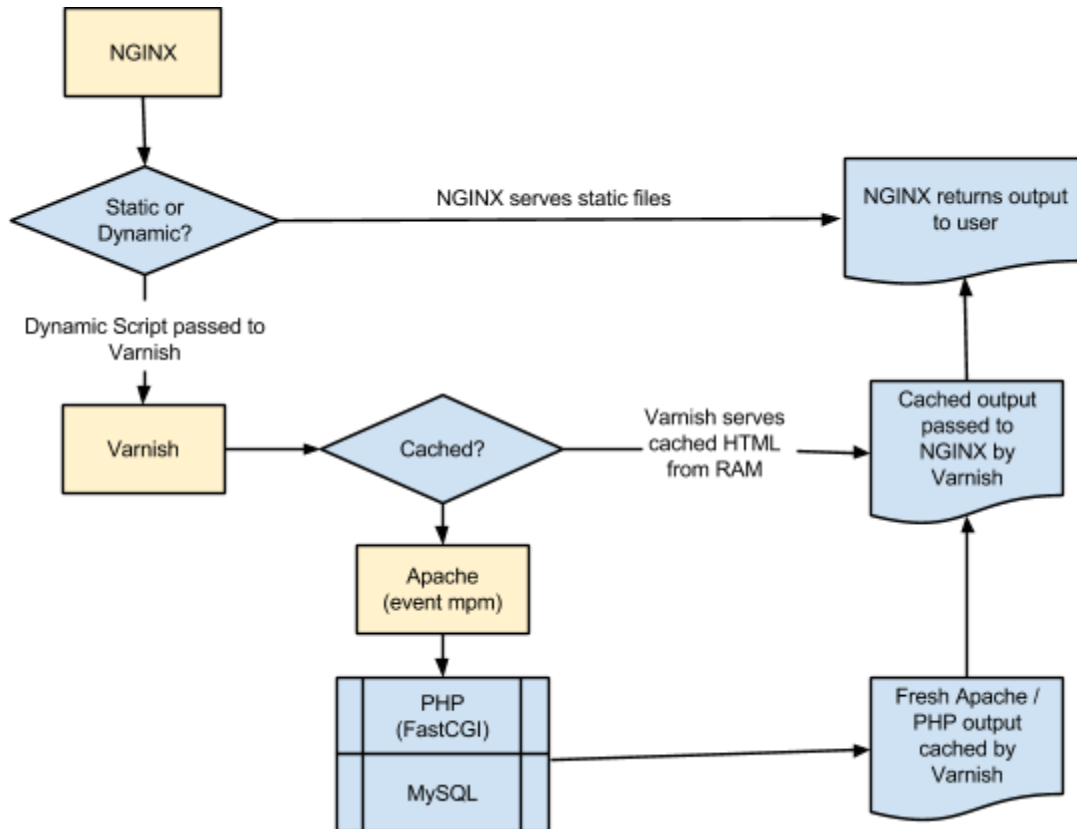
2.2.1 Digital Library Drupal CMS Software Stack

The above diagram shows the software stack as deployed on an Open Source Linux platform. For a more detailed description of key Drupal components please refer to section 4 of this document.

2.3 Risks

The DL depends upon the external Shared Services SSO for the ability to log in. Without these components running, it will not be possible for non-administrator users to log into the DL and view authorized content. Without login, only a subset of the content is available to unauthorized users if a shared link is generated.

The system maintains partial functional dependencies on the Learning Registry, including the availability and functionality to post DL Resources to the Learning Registry and Learning Registry Index Search (subject to a functional inBloom Learning Registry Index Node).

2.4 Assumptions & Limitations

Assumptions:
- User is connected to the Internet.
- Standard browsing ports 443 (https) are not blocked.
- The computer being used is a recent laptop, desktop or mobile device capable of running one of the following browsers: Internet Explorer (Version 9 or higher), Google Chrome (Version 28 or higher), Safari (Version 6 or higher), or Firefox (Version 23 or higher)
- User has access to Vimeo, YouTube, SchoolTube, SlideShare, and TeacherTube.
- Browsers being used to access the site and resources are SSL capable.

Limitations:
- User must always be connected to the Internet while using the site. No offline capabilities are available, with the exception of files downloaded from the site during periods of connectivity.
- For up-to-date Vimeo limitations such as maximum video resolution and file size limits please visit the Vimeo FAQ: http://vimeo.com/help/faq.
- For up-to-date YouTube limitations such as maximum video resolution and file size limits please visit the YouTube FAQ: https://support.google.com/youtube/#.
- For up-to-date SchoolTube limitations such as maximum video resolution and file size limits please visit the YouTube FAQ: http://www.schooltube.com/login/?next=/help/
- For up-to-date SlideShare limitations such as maximum video resolution and file size limits please visit the YouTube FAQ: http://www.schooltube.com/login/?next=/help/
- For up-to-date TeacherTube limitations such as maximum video resolution and file size limits please visit the YouTube FAQ: http://teachertubefeedback.uservoice.com/

Degradation:
- If the user does not have access to Vimeo, YouTube, SchoolTube, SlideShare or TeacherTube, the application will continue to work as expected however, the links that reference these sites will not work and the user will not be able to view the referenced content. Note the DL relies on the third party site's error handling. Specifically, if the third party site has a "graceful" error catching approach (e.g. a message that says this video is no longer available) then this error message will be displayed in the DL. If instead the offering third party site has "ungraceful" error catching and instead displays an error, the DL will also display that error in the preview pane.

2.5   Dependencies

The DL depends on several other external systems to fully function correctly. The following outlines the external systems that are needed for full or partial functionality. An in depth view of the architechture can be found here:
http://www.smarterapp.org/arch/AssessmentSystemArchitecture.html

1.   Shared Services Single Sign On (SSO)/Authentication: The external SSO service and network routing between the DL and the SSO system must be in fully functional order for the users to be able to log in. Should there be an SSO service failure or network communication problem between the two systems, users will be unable to log into the CMS. In cases of network packet loss, slowness and sporadic inability to login may be experienced.

2.   Core Standards: The external Core Standards service and network routing between the CMS and the Core Standards must be in fully functional order for the users to be able to log in. Should there be an service failure or network communication problem between the two systems, users will be unable to tag and retrieve tags for DL resources. In cases of network packet loss, slowness in obtaining tags & adding resource tags may be experienced.

3.   Program Management: The external Program Management service and network routing between the CMS and the Program Management system must be in fully functional order for the users to be able to log in. Should there be an ProgMan service failure or network communication problem between the two systems, users will be unable to log into the DL and will receive an error message. After the initial connection has been made to the Program Management API, the results are cached for further use and updated on each CRON run.

4.   Learning Registry: A Learning Registry Node API must be fully operational in order for the CMS to be able to submit its learning resource data for Learning Registry. The Digital Library utilizes the U.S. Department of Education nodes for publishing as described on http://learningregistry.org/

2.5.1 Content Uploading

The Digital Library allows users to upload content to resources. The user can upload the following file formats: .DOC, .DOCX, .XLS, .XLSX, .PPT, .PPTX, .ODT, .ODP, .ODS, .JPG, .JPEG, .PNG, .PDF, .TXT, .MP4, .MOV, .MP3. If the user chooses to upload any of those file formats the application must have network connectivity to Google Cloud Storage where the file will reside. Google Cloud Storage must be fully operational and there must be no network connectivity problems between the user and Google Cloud Storage. Should the system experience problems or general network connectivity issues, the user may be unable to upload any of those file formats.

2.5.2 Content Linking

The Digital Library allows users to embed content from the following websites: YouTube, Vimeo, SchoolTube, TeacherTube and SlideShare. It is currently not in scope to offer additional services to the user. If a user chooses to link to any of those external sites, those services must be fully operational and there must be no network connectivity problems between the user and the service. Should the service experience problems or general network connectivity issues, the user may be unable to link to the external services.

2.5.3 Content Viewing

The Digital Library allows the user uploaded content to be viewed inside the application when viewing a resource. When a user is viewing content uploaded to the Digital Library as stated in section 2.5.1, if that content is one of the following file formats (DOC, .DOCX, .XLS, .XLSX, .PPT, .PPTX, .ODT, .ODP, .ODS, .PDF, .TXT) then Google Docs Viewer is used to preview the content. If there is an issue with network connectivity between the user and Google Cloud Storage or Google Docs Viewer, the content will not be viewable in the Digital Library.

If the user is viewing content linked to the resource as stated in section 2.5.2, the content will be viewed using the services (YouTube, Vimeo etc) embedded viewer. If there is an issue with network connectivity between the user and the service provider, the content will not be viewable in the Digital Library.

3.   Technical Design Details

What follows is a description of the CMS product and the modules, both contrib and custom, that were used to create the Smarter Balanced Digital Library site.

3.1 Product Selection

Drupal is a leading CMS and web framework built entirely on Open Source software. The portal utilizes the latest stable release, version 7.31, to build the required functionality.

Drupal is written in PHP and most commonly deployed in a Linux environment with a fully Open Source stack, which allows the most flexibility, scalability and transparency. It benefits from constant development of new features, bug fixes and community support by enthusiasts and developers.

It is divided into several key components that together comprise the Drupal CMS.

- **Theming sub-system**: allows flexible customization of the user interface layer.
- **Custom modules**: custom functionality and configuration details for the system.
- **Contrib modules**: Open Source modules that are utilized and built upon to achieve new functionality.
- **Drupal Core**: base system that is responsible for the data persistence, APIs and hooks.

All custom functionality is isolated to the **Custom Modules** layer. All interaction with **Drupal Core** is done via Drupal APIs and hooks allowing for easier updates to the stock Drupal release in the future.

The following diagram shows a more detailed cross section of Drupal with the custom modules that have been developed for the CMS application.
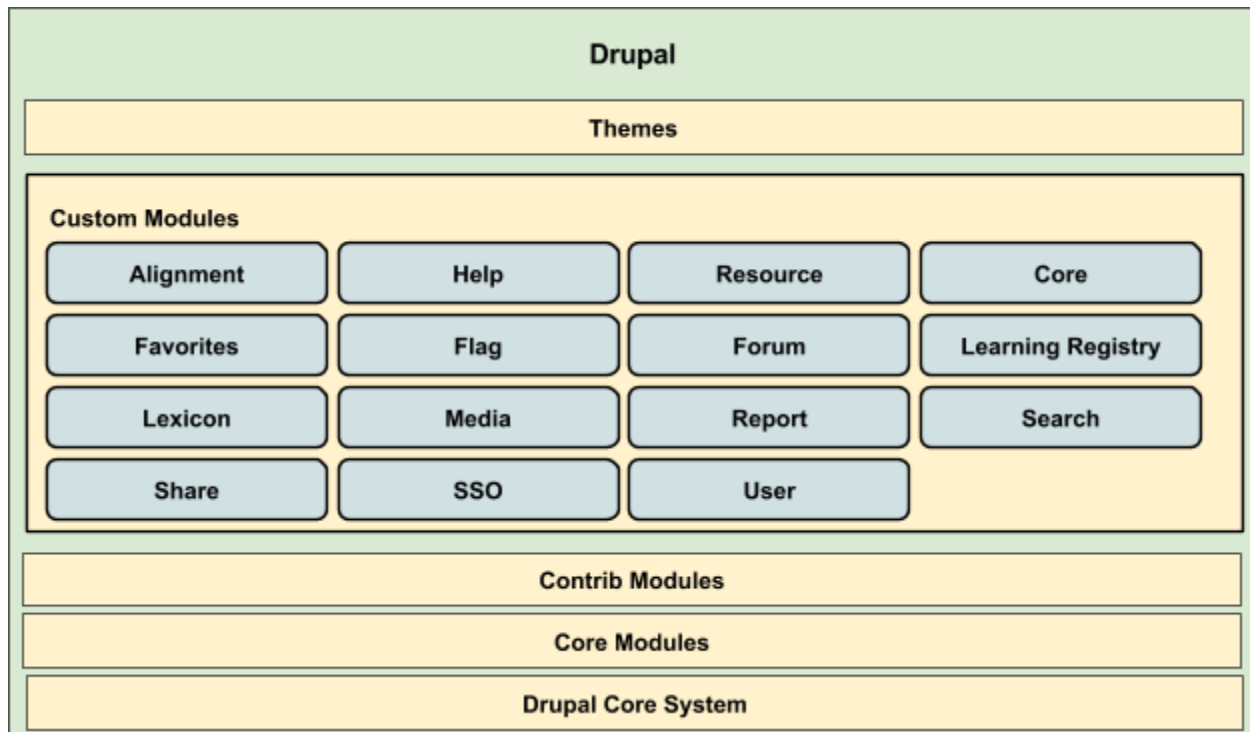
3.2 Drupal Modules

Several contrib and custom modules were used for the project. Contributed modules are developed and supported by the Drupal community whereas custom modules were developed specifically for the Digital Library project. In some cases, the contributed modules were patched to align their functionality with this Digital Library project. In those cases, a "patches" folder is located in the main folder of the repository. This allows the contributed module to be updated should there be one and still have the patch applied afterwards.

A list of modules is presented below. You can access this list and any configuration details by logging in as an administrator into Drupal and navigating to Modules. Another way to get a complete listing of enabled modules is via command line 'drush' tool (Drupal shell). Secure Shell (SSH) into the server and cd into the directory containing the Drupal code. For custom modules, scroll down and click on SBAC on the left-hand side. Alternatively, once logged in, navigate directly to this URL: https://staging.smarterbalancedlibrary.org/admin/modules#_sbac.

cd /var/www/html/sbacdev/docroot/sites/default/
drush pm-list --type=Module --no-core --status=enabled

3.2.1 Drupal Contrib Modules

Below is a list of all of the contrib modules used in the CMS organized by their function/purpose. A single table with all of the contrib modules listed below is available in Appendix A.

3.2.1.1 Administration

This set of modules allows for easy administration and configuration through the Drupal admin pages. The admin menu module creates a global toolbar that allows the admin user access to the Drupal configuration pages. The Filter Permissions module and Module Filter module allow for easy searching and categorization of permissions and modules within the site. The Views Data Export module is used to export a CSV of users in the system.

Module Name	Links/Patches	Version
Administration menu (admin_menu)	https://www.drupal.org/project/admin_menu	7.x-3.0-rc4
Filter permissions (filter_perms)	https://www.drupal.org/project/filter_perms	7.x-1.0
Module filter (module_filter)	https://drupal.org/project/module_filter	7.x-1.8
Views Data Export (views_data_export)	https://www.drupal.org/project/views_data_export	7.x-3.0-beta7

3.2.1.2 Caching

This module aids in caching entities, which greatly decreases the amount of time the application needs to query the database for information on a given entity.

Module Name	Links/Patches	Version

Entity cache (entitycache)	https://drupal.org/project/entitycache	7.x-2.0-alpha2

3.2.1.3 Collaboration

The following modules aid in the Collaboration (forums) section of the site. Comment Goodness provides the ability to sort the Topic Posts in an order other than the default "newest". More Comments removes the default pager and replaces it with a button that loads more content into the current page on click. The Quicktabs module was used to create the tab layout within the Collaboration section.

Module Name	Links/Patches	Version
Comment goodness (comment_goodness)	https://www.drupal.org/project/comment_goodness	7.x-1.4
More Comments (morecomments)	https://www.drupal.org/project/morecomments	7.x-1.0-beta3+3-dev
Quicktabs (quicktabs)	https://www.drupal.org/project/quicktabs	7.x-3.6

3.2.1.4 Content Layout

These modules facilitate content layout and creation of landing pages throughout the site: specifically, library pages and collaboration pages. The views module creates lists of content, which creates the Digital Library, Resource Reveiw, My Resource and Collaboration views. Context is used to control the layout on the Collaboration pages depending on who's viewing the page.

Module Name	Links/Patches	Version
Context	https://www.drupal.org/project/context	7.x-3.2
Views (views)	https://drupal.org/project/views	7.x-3.3

3.2.1.5 Content Type

These modules help extend content types by adding new field types, field widgets, and field validators. Field types that have been added include: date fields, entity reference fields and media fields.

- Chosen module uses the jQuery plugin to make the select lists more user friendly.
- Date fields allow admins to add fields to entities that store dates. Dates can be stored in a wide range of formats, from UNIX timestamp to MYSQL DATETIME format. Current configurations can be viewed and modified via the admin menu: Configuration-Regional and language-Date and time.
- Display Suite is used to create node views that control layout and content without having to create template files.
- Entity reference fields allow admins to add fields that allow users to attach entities to other entities, creating a relationship between the entities.
- Field Collection and Field Group allow the content to be grouped into containers programmatically.
- Field validators allow the admin to add validators to fields without having to code such validations, in this case a Javascript Maxlength validator and Phonetic Worldfilter validator. The Maxlength validator is attached to a field using the Field UI. It allows a system admin to configure the validator per field. The Phonetic Wordfilter is used to restrict the content that a user is allowed to input.
- Workbench and Workbench Moderation adds arbitrary moderation states to Drupal core's "unpublished" and "published" node states, and affects the behavior of node revisions when nodes are published.

Module Name	Links/Patches	Version
Chosen (chosen)	https://drupal.org/project/chosen	7.x-2.0-alpha4
Date (date)	https://drupal.org/project/date	7.x-2.7
Date API (date_api)	https://drupal.org/project/date	7.x-2.7
Date Popup (date_popup)	https://drupal.org/project/date	7.x-2.7
Display Suite (ds)	https://www.drupal.org/project/ds	7.x-2.6
Draggableviews (draggableviews)	https://drupal.org/project/draggableviews	7.x-2.0

Entity Reference (entityreference)	https://drupal.org/project/entityreference	7.x-1.1
Field collection (field_collection)	https://drupal.org/project/field_collection	7.x-1.0-beta7
Fieldgroup (field_group)	https://drupal.org/project/field_group	7.x-1.4
IMCE Wysiwyg API bridge (imce_wysiwyg)	https://www.drupal.org/project/imce_wysiwyg	7.x-1.0
Label Help (label_help)	https://www.drupal.org/project/label_help	7.x-1.0
Link (link)	https://www.drupal.org/project/link	7.x-1.2
Maxlength (maxlength)	https://drupal.org/project/maxlength	7.x-3.0-beta1
Phonetic Wordfilter (phonetic)	https://www.drupal.org/project/phonetic	7.x-2.0
Publish Content (publishcontent)	https://www.drupal.org/project/publishcontent	7.x-1.3
Title (title)	https://www.drupal.org/project/title	7.x-1.0-alpha7
Workbench (workbench)	https://www.drupal.org/project/workbench	7.x-1.2
Workbench Moderation (workbench_moderation)	https://www.drupal.org/project/workbench_moderation	7.x-1.3
Wysiwyg (wysiwyg)	https://drupal.org/project/wysiwyg	7.x-2.2

3.2.1.6 Deep Linking

The Pathauto module automatically generates URL/path aliases for various kinds of content (nodes, taxonomy terms, users) without requiring the user to manually specify the path alias. This allows you to have URL aliases like */category/my-node-title* instead of */node/123*. The aliases are based upon a "pattern" system that uses tokens which the administrator can change.

Module Name	Links/Patches	Version
Pathauto (pathauto)	https://drupal.org/project/pathauto	7.x-1.2

3.2.1.7 Dependency

These modules are dependencies added for other modules within the site. These modules are not interacted with directly and thus require no configuration; however, other modules use their APIs and functions. These modules have the same upgrade path as other contrib modules. Dependencies among modules can be viewed by looking at the info. of a particular module file. The table below lists only the most important dependencies.

Module Name and Most Important Dependencies	Links/Patches	Version
Libraries (libraries)	https://drupal.org/project/libraries	7.x-2.2
Chaos tools (ctools)	https://drupal.org/project/ctools	7.x-1.4
Token (token)	https://drupal.org/project/token	7.x-1.5
Transliteration (transliteration)	https://drupal.org/project/transliteration	7.x-3.2
Views UI (views_ui)	https://drupal.org/project/views	7.x-3.8
X Autoload (xautoload)	https://www.drupal.org/project/xautoload	7.x-4.5

3.2.1.8 Deployment

These modules aided in the help of deploying the DL to multiple environments. Features allows Drupal configuration that is typically stored in the database to be stored within code, which allows for versioning the configuration as well.

Module Name	Links/Patches	Version
Features (features)	https://drupal.org/project/features	7.x-2.0
FE Block (fe_block)	https://www.drupal.org/project/features_extra	7.x-1.0-beta1
Strongarm (strongarm)	https://drupal.org/project/strongarm	7.x-2.0
User Import (user_import)	https://www.drupal.org/project/user_import	7.x-2.2

3.2.1.9 Development

These modules aided developers in streamlining development processes. These modules are typically used for best practices and simplifies the UI for developers and admins when work is needed to be done in the UI.

Module Name	Links/Patches	Version
Dev Tools (devtools)	https://www.drupal.org/project/devtools	7.x-1.x-dev
Dialog API (dialog)	https://www.drupal.org/project/dialog	7.x-1.x-dev
Diff (diff)	https://www.drupal.org/project/diff	7.x-3.2
Entity API (entity)	https://www.drupal.org/project/entity	7.x-1.5
Entity Construction Kit (eck)	https://www.drupal.org/project/eck	7.x-2.0-rc2
HTTP Parallel Request Library (httprl)	https://www.drupal.org/project/httprl	7.x-1.14

| Views fields combine (views_fields_combine) | https://www.drupal.org/project/views_fields_combine | 7.x-1.2 |
| Voting API (votingapi) | https://drupal.org/project/votingapi | 7.x-2.11 |

3.2.1.10 File Handling

These modules comprise video, image and document handling.
- The Embedded Media Field module creates fields that allow images, video and audio files to be embedded from third party sources such as Youtube.
- File entity module provides interfaces for managing files and extends the core file entity, allowing files to be fieldable.
- Google CDN module allows any images, videos or documents that are uploaded into Drupal to still be managed by Drupal, but instead of being stored and served from local storage, actual files will be uploaded to Google Cloud Storage and delivered through the high performance network.
- IMCE is an image/file uploader and browser that supports personal directories and quota.
- The Media module is what allows the admin to add file upload fields to the node form. The media module also has multiple configuration forms to allow the admin to change the look of the uploaded media based on type of uploaded file.
- Upload QC extends Drupal core and offers checks and validations during the upload process.

Module Name	Links/Patches	Version
Embedded Media Field (emfield)	https://www.drupal.org/project/emfield	7.x-1.0-alpha2
File entity (file_entity)	https://drupal.org/project/file_entity	7.x-2.0-alpha3
Google CDN	https://www.drupal.org/sandbox/teknic/2225051	7.x-1.0
IMCE	https://www.drupal.org/project/imce	7.x-1.9
Media (media)	https://drupal.org/project/media	7.x-2.0-alpha2

| Upload QC (upload_qc) | https://www.drupal.org/project/upload_qc | 7.x-1.x-dev |

3.2.1.11 Glossary

This module generates one or more Lexicon pages based on terms in taxonomies.

Module Name	Links/Patches	Version
Lexicon (lexicon)	https://www.drupal.org/project/lexicon	7.x-1.10

3.2.1.12 Learning Registry

This module facilitates the CMS's integration with the Learning Registry Index which was previously provided by InBloom. The inBloom LRI REST Search API was terminated with the dismantling of inBloom and in turn external search capabilities have been disabled in the Digital Library since April 2014. However, if an LRI node were propegated (matching the API specifications of the inBloom LRI API Reboot 2.0 API - https://github.com/inbloom/lri-reboot-2.0), external search capability could be pointed to that node's URI and re-enabled in the Digital Library.

Module Name	Links/Patches	Version
Learning Registry (learning_registry)	https://drupal.org/project/learning_registry	7.x-1.0

3.2.1.13 Legal

This module aids in the management and displaying of the legal "Terms and Conditions" page.

Module Name	Links/Patches	Version
Legal (legal)	https://www.drupal.org/project/legal	7.x-1.5

3.2.1.14 Notifications

This module creates the database structure to allow for notifications to be sent from one or many users to one or many users.

Module Name	Links/Patches	Version
Taskit (taskit)	https://www.drupal.org/project/taskit	7.x-1.0

3.2.1.15   Paradata

These modules help to collect paradata about the resources on the site. Fivestar allows for nodes in the system to be rated by users. Google Analytics is used both for traffic analysis and page counts for nodes. The rate module also allows the admin to create widgets that enables users to rate content. In this case the "Like" rate widget was created and added to resource nodes, reviews and forums.

Module Name	Links/Patches	Version
Fivestar (fivestar)	https://drupal.org/project/filvestar	7.x-2.1
Google Analytics (googleanalytics)	https://drupal.org/project/googleanalytics	7.x-1.4
Rate (rate)	https://drupal.org/project/rate	7.x-1.7
Voting API (votingapi)	https://drupal.org/project/votingapi	7.x-2.11

3.2.1.16 Performance

These modules allow for better performance on the Drupal site. Fast 404 lowers the amount of time and resources that a 404 page uses by default in core Drupal. Memcache module provides integration between Drupal and Memcache, to increase performance by storing cache tables in memory vs the database.

Module Name	Links/Patches	Version

Fast 404 (fast_404)	https://www.drupal.org/project/fast_404	7.x-1.3
Memcache (memcache)	https://www.drupal.org/project/memcache	7.x-1.1

3.2.1.17 Printing

The following modules allow for dynamically created content to be rendered in printer friendly versions. The PDF version allows for the content to be rendered via PDF. Views PDF Display takes content that is displayed in a view to be outputted to a print friendly version of the page.

Module Name	Links/Patches	Version
PDF version (print_pdf)	https://www.drupal.org/project/print	7.x-1.3
Printer-friendly pages (print)	https://www.drupal.org/project/print	7.x-1.3
Views PDF Display (views_pdf)	https://www.drupal.org/project/views_pdf	7.x-1.3

3.2.1.18 Reports

This module is a simple plugin for Views that adds the option to contextually filter not just by a single value, but also by range.

Module Name	Links/Patches	Version
Views Contextual Range Filter (contextual_range_filter)	https://www.drupal.org/project/contextual_range_filter	7.x-1.6

3.2.1.19 Search

Search is done using the ApacheSolr and corresponding modules. All aspects of the search index can be configured by modifying the schema.xml file and opening a ticket with Acquia. The actual schema file is stored in the code repository at docroot/sites/all/modules/contrib/apachesolr/solr-conf/solr-1.4. It is also viewable at http://drupalcode.org/project/apachesolr.git/blob/329c47373b1c97d9b0314dee7a6ce51b1afa963c:/solr-conf/solr-1.4/schema.xml

The Acquia related modules allow for the Drupal site to connect to Acquia's Search functionality which leverages ApacheSolr. Other simpler modifications can be made by using the admin UI. The facet module is used in order to provide a facet-based search, which allows for drill down type searches. Other modules were added to allow other entities to be indexed within the ApacheSolr index, as it currently only allowed nodes. The attachments module allow users to search for files that have been attached to a node.

Module Name	Links/Patches	Version
Acquia agent (acquia_agent)	https://drupal.org/project/acquia_connector	7.x-2.14
Acquia search (acquia_search)	https://drupal.org/project/acquia_connector	7.x-2.14
Acquia Search Multi Subscription (acquia_search_multi_subs)	https://www.drupal.org/project/acquia_search_multi_subs	7.x-1.1
Acquia Site Profile Information (acquia_spi)	https://www.drupal.org/project/acquia_connector	7.x-2.14
Apache Solr search attachments (apachesolr_attachments)	https://www.drupal.org/project/apachesolr_attachments	7.x-1.3
Apache Solr framework (apachesolr)	https://drupal.org/project/apachesolr	7.x-1.6

Apache Solr search (apachesolr_search)	https://drupal.org/project/apachesolr	7.x-1.6
Apache Solr Users (apachesolr_user)	https://drupal.org/project/apachesolr_users	7.x-1.x-dev
Apache Solr Views Integration (apachesolr_views)	https://drupal.org/project/apachesolr_views	7.x-1.0-beta2
Facet API (facetapi)	https://drupal.org/project/facetapi	7.x-1.3

3.2.1.20 Security

This module emits a 404 error when a user tries to access a page that they don't have permission to view.

Module Name	Links/Patches	Version
403 to 404 (m4032404)	https://www.drupal.org/project/m4032404	7.x-1.0-beta2

3.2.1.21 Theming

These modules allow the admin to modify the DOM elements for menus and files in order to allow developers to easily theme files and node editing forms. jQuery update is more for upgrading the jQuery library in order to reap the benefits of the latest version of the library.

Module Name	Links/Patches	Version
FlexSlider (flexslider)	https://www.drupal.org/project/flexslider	7.x-2.0-alpha3
jQuery Update (jquery_update)	https://drupal.org/project/jquery_update	7.x-2.4
Views Load More (views_load_more)	https://www.drupal.org/project/views_load_more	7.x-1.1+23-dev

Zurb Joyride Context (joyride)	https://www.drupal.org/project/joyride	7.x-1.0-alpha2

3.2.2 Drupal Custom Modules

Below is the list of the Drupal custom modules developed for the CMS along with a description of each one's purpose/role.

Module Name	Description
SBAC Central	Core module for central functions and running updates to codebase. This module uses hook_update_N implementations, which are run when update.php is run or drush is used to update the database. https://api.drupal.org/api/drupal/modules%21system%21system.api.php/function/hook_update_N/7
SBAC Alignment	Adds the Alignment content type. This content type is used to store the Common Core State Standards for a given resource. As well, this module handles the import from the CCSS API.
SBAC Help	Adds the Help content type. This content type is used for the Welcome Tutorial and Resource Tutorial. The module also builds and controls the look and feel of the said tutorials.
SBAC Resource	Adds the Resource content type. This content type is the primary content type in the system. The module handles the multi-step form creation process, displaying the node view and and creating the Digital Library Resources, Resource Review and My Resources pages.
SBAC Core	Handles the reviewer workflow for gate keeping, quality criteria and needs posting. As well, the resubmission process for resources is contained here. The contrib module taskit is extended here, where we create custom templates for each of the defined notifications in the system.

SBAC Favorites	Handles the entire functionality around favoriting resources or forums including the database schema, account profile listing and javascript behavior.
SBAC Flag	Responsible for all functionality related to flagging resources, resource review and forum topics.
SBAC Forum	Provides all forum related functionality. Creates the landing pages for resource forums and topics forums. Exports the views related to the content and provides the scaffolding for the searching provided on the forums pages.
SBAC Learning Registry	Integrates InBloom's LRI Reboot API v2.0. This module currently implements a custom views query plugin. It currently uses a REST interface; therefore with introductions of new parameters in the LRI API, the plugin can be extended to support the new queries.
SBAC Lexicon	Provides the Glossary landing page and ties together the related taxonomy terms to the UI look and feel of the page.
SBAC Media	Creates the custom widgets that allows users to upload materials to resources. Controls everything from look and feel to the underlying functionality with saving files, preventing duplicates and saving embedded media. As well, the HTML5 asynchronous upload process is contained here.
SBAC Report	All reporting functionality is in this module including the report menu item, access control, creation of the tab layouts, the filters per report and creation of the CSV reports.
SBAC Search	Handles the search capabilities. This module integrates with the internal Apache Solr search. It indexes custom fields that are added through the Field API. It also provides for the library pages and the AJAX portion for the library pages. The search module is also responsible for the current hierarchy of search results.
SBAC Share	Provides the ability to share a resource to an anonymous user via custom link and hash. Provides the share tab on the resource node view page and

	allows the link to be shared. When the link is called the module will verify it is still valid and display the content in a custom template that does not allow the user to access other Digital Library content.
SBAC SSO	Implements the SSO login process. When a SAML assertion is received the module verifies its structure and contents are to the accepted standard. As well, will call the Program Management API and verify that user is valid and in good standing. Once this is complete, the user is attributes are updated or a new user is created in the Drupal system. If all went well, the user is logged into the system. If any errors are encountered the user is no logged in and a error page is presented.
SBAC User	Handles all user related functionality including the exporting of fields for the user account, the account profile page and the user first login wizard.

3.2.3 Features and Settings

Configurations and settings are maintained via Feature exports in Drupal. This allows the developers to set required settings via code for version control and easy portability between different environments. These settings may apply to all modules, not just custom ones.

The Features screen is accessible to system administrators via the Drupal admin menu: Structure -> Features. System administrators can click on the module name and see what configuration settings (if any) have been exported as Features. See snapshot below.

Features

Manage Create feature Settings

Features

~SBAC

Features

FlexSlider

Testing

	Feature	Signature	State	Actions
☑	**SBAC Alignment** Provides related functionality of Alignment Content Type.	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Central** Provides the core functionality for SBAC	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Core** Custom SBAC components extending the Dev Tools framework	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Favorites** Provides the favorites functionality	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Flag** Handles the flag functionality of the resource.	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Forum** Adds Collaboration/Forum functionality	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Help** Adds the help tutorial functionality Required by: SBAC Forum, SBAC User	Unavailable 7.x-1.0	Default	Recreate
☐	**SBAC Learning Registry** Provides integration with the Learning Registry	Unavailable 7.x-1.0	Disabled	Recreate
☑	**SBAC Lexicon** Provides customization on top of the lexicon functionality	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Media** Provides media support for File Entity and the Media module to display SchoolTube, TeacherTube and Slideshare.	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Report** SBAC Report	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Resource** Provides resource node functionality Required by: SBAC Forum, SBAC User	Unavailable 7.x-1.3	Default	Recreate
☑	**SBAC Search** Provides search functionality	Unavailable 7.x-1.0	Overridden	Recreate
☑	**SBAC Share** Handles the share functionality of the resource.	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC SSO** Provides the SSO functionality	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC User** Provides the user related functionality Required by: SBAC Forum	Unavailable 7.x-1.0	Default	Recreate
☑	**SBAC Workbench** Provides the workbench related functionality	Unavailable 7.x-1.0	Default	Recreate

Save settings

3.3 Hardware & Software Environment

Below is a table outlining all of the hardware and software elements currently used in the CMS, along with their specification and provider.

Table 5: Hardware and Software Elements

Capability	Specification	Provider	Vendor	Vendor Product	Tenancy
Platform Management	AWS Acquia	Acquia	Amazon	Acquia Cloud	Subscription
Web and Application Server	AWS Apache 2.2.14	Acquia	Amazon	Acquia Cloud	Subscription
CMS	Drupal	Acquia	Acquia	Drupal 7	Dedicated
Load Balancer	NGINX and Varnish	Acquia	Acquia	Acquia Cloud	Subscription
Database	MySQL v.5.5	Acquia	Amazon	AWS RDS	Shared
Guest OS	Ubuntu 10.04 LTS	Acquia	Amazon	Ubuntu Cloud Server 12.04	Dedicated

3.4 Logical Design

Figure 1: Logical Design
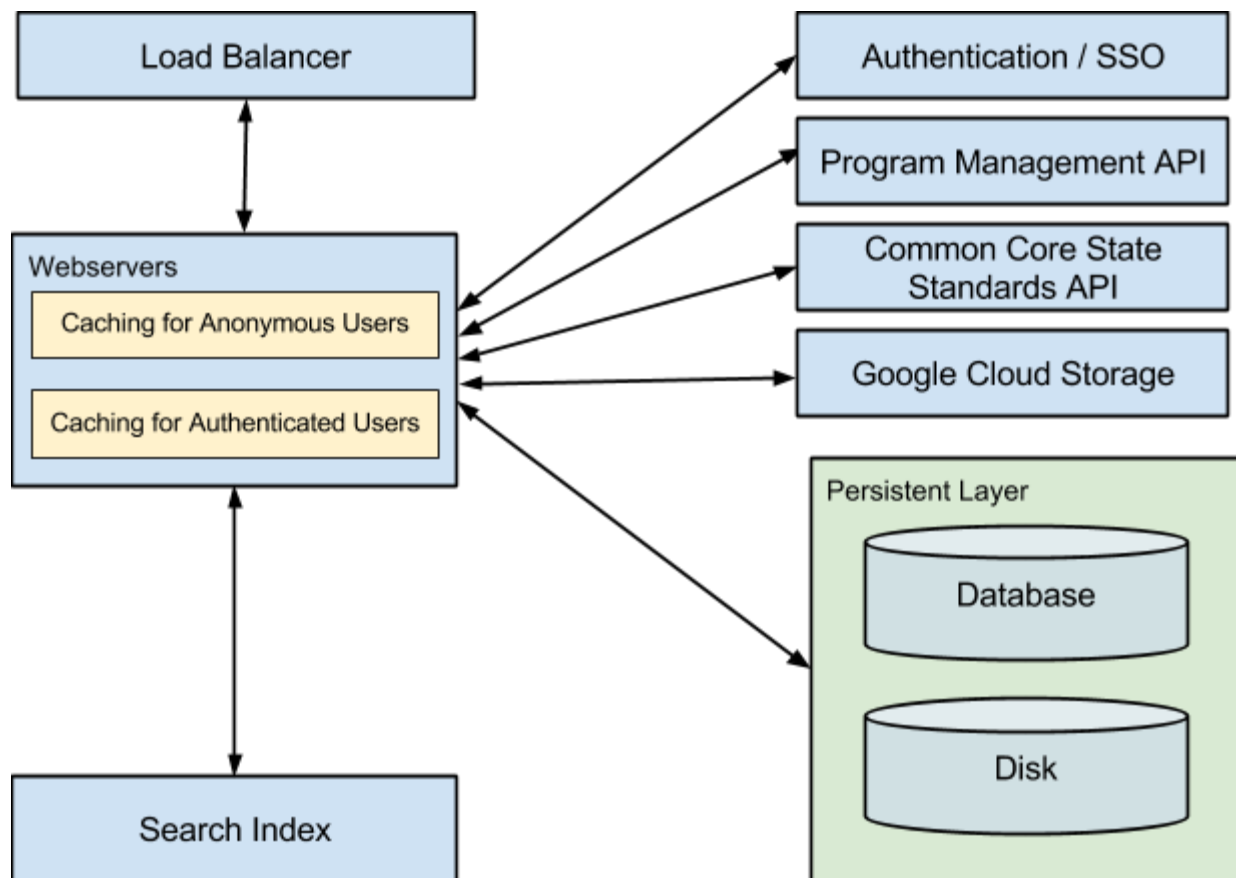
3.4.1 Content Architecture/Logical Data Model

This section describes the Drupal content architecture of the system, which is organized into entities of different types. These content types are defined in the SBAC Content Types module and are accessible via the Drupal admin menu: Structure -> Content Types.

Content Types can be thought of as a Logical Data Model. They contain all the required fields to allow persistent data storage. At the database level the data may be split into several tables. The custom Content Types developed for the DL are listed below.

Below are tables providing the composition of each content type that is actively being used in the DL.

3.4.1.1 Resource Node Type

Field	Type	Notes
Title	Node module element	Internal Drupal field
Resource Type	Term Reference	
Intended End User(s)	Term Reference	
Attributes	Term Reference	
Connection to FAP	Long Text	
Student Engagement in the Formative Assessment Process	Long Text	
Body	Long Text	
Document ID	Text	
License Information	List (text)	
Author	Text	
Owner	Text	
License for Primary Material	Term Reference	
License(s) for Secondary Material(s)	Term Reference	

Copyright Clearance Form(s)	File	Private file
Personally Identifiable Student Information	List (integer)	
Subjects and Domains	Term Reference	
Grade(s)	Term Reference	
Alignment Tags	Text	
Common Core Standard(s)	Term reference	Alignment Content Type
Connection to CCSS	Long Text	
Learning Goals	Long Text	
Success Criteria	Long Text	
Contexts	Long Text	
Supporting Evidence	Long Text	
Principles	Long Text	
Digital Media Type(s)	Term Reference	
Intended Student Population(s)	Term Reference	
Geographical Setting(s)	Term Reference	
Educational Use	Term Reference	
Technologies Required for Use in Classroom	Term Reference	

Module Type	Term Reference	
Subscription Package Type	List (integer)	
View Permissions	List (integer)	
View Permissions Per State	Term Reference	
What can people do with this resource?	List (integer)	
Permanent Link Settings	List (integer)	
Temporary Public Link Settings	List (integer)	
Temporary Public Link Time	List (integer)	
Posting Options	List (integer)	
To contributor	Long Text	
URL Path Settings	Path module form elements	
Thumbnail URI	Long Text	Stores the thumbnail location for the primary material
Temp	Boolean	
Unique Views	Integer	
Total Views	Integer	
Resource State	List (text)	

HTML5	Boolean	
Asset Downloads	Integer	
Unique Downloads	Integer	
Node Average Rating	Float	
Recent Reviewers	Entity Reference	User
Recent Publisher	Entity Reference	User
Is Hidden	Boolean	

3.4.1.2 Alignment Node Type

Field	Type	Notes
Title	Node module element	Internal Drupal field
Select your Common Core Standard(s)	Term Reference	
Alignment Type	Term Reference	
Resource Reference	Entity Reference	Resource Content Type
URL Path Settings	Path module form elements	
Dot Notation	Text	
Item URL	Text	
Description	Body	

3.4.1.3 Help Node Type

Field	Type	Notes
Title	Node module element	Internal Drupal field
Summary	Long Text	
Body	Long Text and summary	
Help Page Topic	Term Reference	
User Roles	Term reference	
Help Icon	Image	
URL Path Settings	Path module form elements	

3.4.1.4 Topic Node Type

Field	Type	Notes
Title	Node module element	Internal Drupal field
Description	Long text and summary	
Files	File	Private File
Links	Link	
Forum	Term Reference	
Topic Default	Boolean	
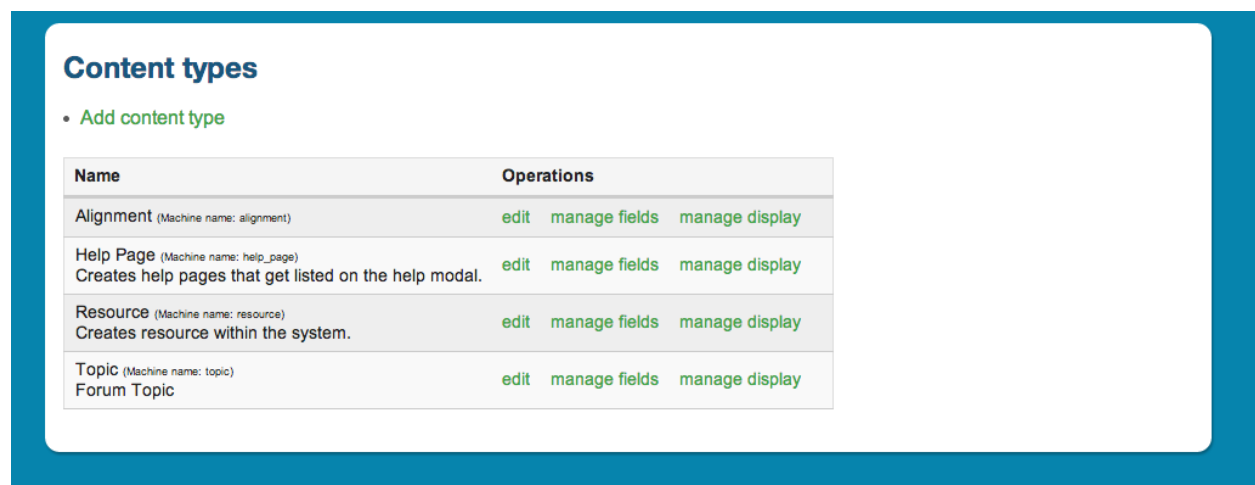
URL path settings	Path module form elements	

3.4.2 Drupal Content Type Menus

System administrators can access and configure the fields for content type templates and display through the Drupal Admin menu: Structure -> Content Types. Through this menu, system administrators can execute a range of changes, including:
- Changing the titles of fields
- Changing the order in which fields display on the templates
- Adding help text to template fields
- Designating certain template fields as "required"
- Adjusting the character limit for certain text fields (e.g., Subtitle)
- Changing the default image for a particular content type

3.4.2.1 Content Type Menu

To make these changes, system admins can click on the "manage fields" link next to a particular content type. On-click, the system will display all of the fields available for the resource template, as well as information about the type of field and their order on the template. Clicking on the "edit" button on any of the template field rows will take system administrators to the full field description and its elements.

3.5 Environments

CMS development and hosting has been accomplished using a number of environments, all hosted by Acquia. Below is a table outlining all of the environments used during

development and testing of Smarter Balanced Assessment Consortium, along with a description of their purpose.

Table 6 Acquia Environments

Acquia Subscription	Acquia Host Environment	Description	Address
[SBAC] Managed Cloud Prod	Dev	Development	dev.smarterbalancedlibrary.org
	Dev Search	Development Search test environment	N/A (SOLR instance tied to Dev Site)
[SBAC] Managed Cloud Prod	Stage	Staging	stage.smarterbalancedlibrary.org
	Stage Search	Staging Search test environment	N/A (SOLR instance tied to Staging Site)
[SBAC] Managed Cloud Prod	IT	Integration Test	integration.smarterbalancedlibrary.org
[SBAC] Managed Cloud Prod	Prod	Production	www.smarterbalancedlibrary.org

3.6 Operational Information

The following section gives the operational details of accessing the system as well as the code. Included below is information related to site monitoring, updating Drupal, updating Drupal modules, and accessing and configuring Apach Solr Search.

3.6.1 Site Monitoring

Site monitoring is handled by using the https://insight.acquia.com/add-ons/new_relic Software as a Service (SaaS) offering. Another add-on provided by the Acquia platform that can help monitor the sites performance is TraceView. All Acquia platform add-ons can be found at here https://insight.acquia.com/.

3.6.2 Admin Level Drupal Login

The Admin level Drupal login can be used to view Drupal logs, enable/disable modules or change configuration details. Drupal accounts, including those for system administrators, can be added via the Drupal admin menu.

Staging:
https://staging.smarterbalancedlibrary.org/
username: smarterbalancedlibrary@amplify.com
password: 4ppn0v4710n

Production:
https://www.smarterbalancedlibrary.org

3.6.3 Acquia Insight Login

Acquia Insight dashboard is the portal for controlling the cloud environments. It is used to deploy new code, make database or file backups, add new team members, grant SSH and code repository access as well as download Apache, Php or Mysql logs.

To get access to the Acquia dashboard for the DL project, one must first create an account with Acquia at https://insight.acquia.com . An existing technical contact for the site must then add the new member's email address to the project. The new team member will then receive a confirmation email with a link to Acquia to confirm and finalize the association with the project.

For a general tutorial on the Acquia dashboard please see
https://docs.acquia.com/cloud/getting-started

3.6.4 Deployment

Acquia provides a git repository which is used to keep code under version control and it's also used to deploy code. Environments can be configured to pull code from git branches (https://insight.acquia.com/cloud/workflow?s=932481). Once an environment is set up to pull code from a specific branch, any time a change is pushed to the branch, it will be pulled into the environment automatically.

3.6.5 Backup

Acquia is responsible as the operator of the production environment. On the Acquia hosting environment there are two types of backups, automatic and on demand. Automatic backups are set as cron tasks by Acquia representatives, and run daily. Additional cron tasks to supports backups can be made here https://insight.acquia.com/cloud/cron?s=932481. Developers and technical contacts can create on demand backups if need be as well. On demand backups can be done via the cloud UI Workflow page https://insight.acquia.com/cloud/workflow?s=932481. Developers can also create on demand backups using Drush. Backup files can be downloaded from https://insight.acquia.com/cloud/backups?s=932481.
The backup procedure is available here: https://docs.acquia.com/cloud/arch/availability.
Documentation about the management or adjustment of Cron settings is available here: https://docs.acquia.com/cloud/manage/cron.
Documentation about the management of logging configurations is available here: https://docs.acquia.com/cloud/configure/logging.

3.6.6 Restore

In order to restore code, it is best practice to create tags within git to be able to roll back from the workflow page https://insight.acquia.com/cloud/workflow?s=932481. The workflow page will list all branches and tags that can be deployed to an environment. In order to restore databases, one can navigate to the backups page https://insight.acquia.com/cloud/backups?s=932481, navigate to the environment to which you'd like to restore the database, and select the restore option from the operations dropdown.

3.6.7 Code Repository

The code for the CMS is version controlled via Git and is hosted at Acquia.

To view the code, type the following at the command line:
git clone sbac@svn-6098.prod.hosting.acquia.com:sbac.git

NOTE: you must have git installed, and have your SSH key added to the project via Acquia dashboard under "Users and keys" section. For help generating SSH keys see section 4.5.5 Generating SSH keys

3.6.8 Shell Access (SSH)

In order to be able to SSH into the server you must first generate and add an SSH key to the project in the "Users and keys" section of the Acquia portal. Once the key is generated, you will be allowed access to the code repository and SSH access to the servers. For example, to SSH to the development and staging server (which are located on the same machine) type the following at the command line.

Dev, Integration and Staging Access:
ssh sbac@staging-6153.prod.hosting.acquia.com

Production Access:
ssh sbac@web-7297.prod.hosting.acquia.com

NOTE: you must have Openssh (Mac/Linux) or Putty (Windows) installed. For instructions on how to generate your SSH key please see the next section.

3.6.9 Generating SSH keys

· Mac/Linux: https://docs.acquia.com/cloud/ssh/enable/key-mac-unix
· Windows: https://docs.acquia.com/cloud/ssh/enable/key-windows

3.6.10 Drupal Upgrades
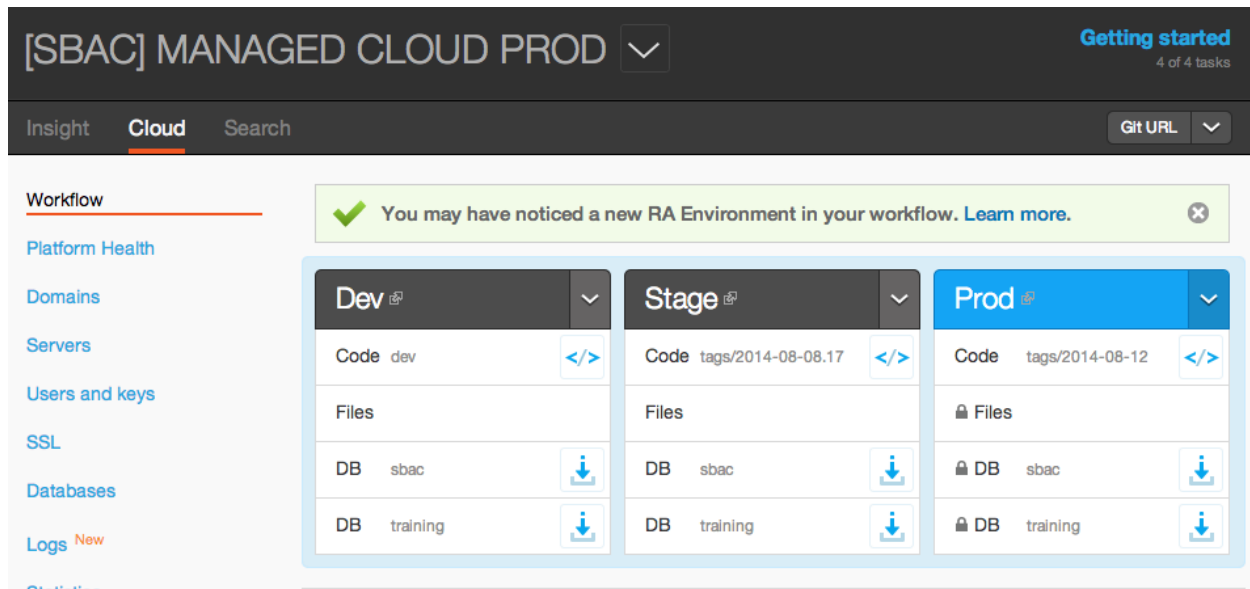
As Drupal evolves, the community will release core upgrades to resolve issues that may arise. The system as of writing is currently running on Drupal 7.31. In order to perform a core upgrade, it is important to follow the guide on doing this properly. The community documentation is located at https://docs.acquia.com/cloud/manage/upgrade.

3.6.11 System updates

The CMS codebase tree contains many branches which correspond to major features developed during the course of the project. For the purposes of ongoing maintenance, the most important branches are '**dev**', '**stage**' and '**master**'. Given that 'dev' is deployed to the development environment and 'stage' to the staging environment, one can deploy new code simply by committing a change and pushing it to the Acquia git repository under the correct branch. The code is then automatically deployed after a short delay.

For Production releases, **tags** are used to denote the appropriate and stable code snapshot. The tags are then pushed to the Acquia code repository and can be deployed just like branches. In the following screen shot, note that the blue box labeled **Prod** is running code '**tags/v0.1**'. Using tags for production deployment helps ensure that all production deployments are deliberate and system changes do not happen accidentally when someone merges some code into the master branch.

IMPORTANT NOTE: Prior to any code pushes up to the repository, developers must verify through the Acquia dashboard (https://insight.acquia.com) which code branch is deployed to which environment. It is possible to accidentally deploy branch deployments across different environments. The following screenshot details where to check code deployment. Note the red boxes that highlight the navigation within the Acquia site and the code branches deployed to each environment. This interface is managed by Acquia and may change at any time. The screenshot is accurate as of writing of this document.

3.6.12 Module Updates

Contributed modules need to be upgraded regularly in order to fix any security issues within the module if any do arise. In order to test module upgrades, the following steps are taken to ensure the module continues to function as intended.

1. Ensure the current git branch is at the latest change.
2. Create a git branch to test the upgrade on
3. Upgrade the module either by downloading it manually or using drush
4. Run any database update scripts that might have been introduced with the upgrade.
5. Test the application to ensure the module is currently functioning as intended.
6. Merge the upgrade branch into the development line
7. Push the merged code and check the dev environment to ensure the module works as intended
8. Propagate the changes to the staging and production environments

3.6.13 Apache Solr Search

Apache Solr Search is currently implemented using the apachesolr and acquia_search module. The module is configured using the admin menu: Configure-> Search ->
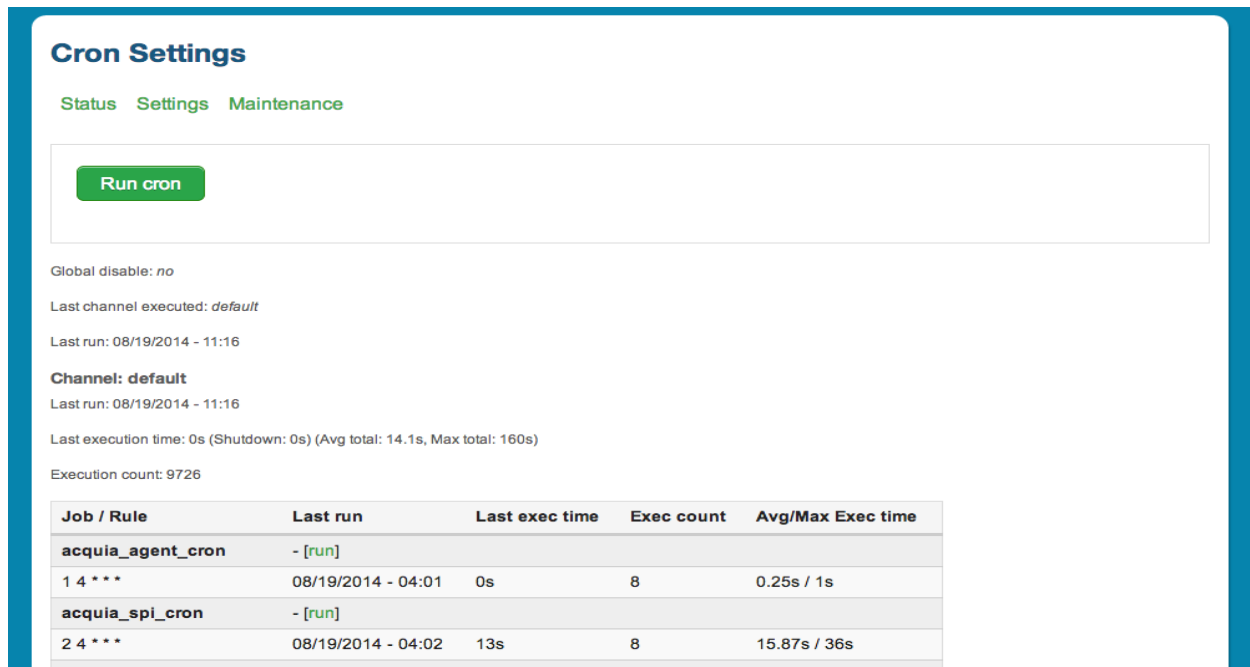
Apachesolr. If the need arises to make modifications to the ApacheSolr schema.xml or the ApacheSolr solrconfig.xml, a ticket can be raised with Acquia to make the change.

3.6.13.1 Apach Solr Search: Current Configuration

The ApacheSolr module is configured to search for keywords that are comprised from all the fields on a given content type. Each fields' bias can be configured to give higher precedence to fields when searching. Currently the results are sorted using the most relevant on top and least relevant at the bottom.

3.6.13.2 Re-indexing Apache Solr Search

Apache Solr search is periodically re-indexed to include newly added content through Cron. A system administrator can access the settings for Cron (including the rate at which it runs) and even re-index content manually for search via the Drupal Admin menu: Configuration -> Cron.

Cron Settings

Status Settings Maintenance

Run cron

Global disable: *no*

Last channel executed: *default*

Last run: 08/19/2014 - 11:16

Channel: default
Last run: 08/19/2014 - 11:16

Last execution time: 0s (Shutdown: 0s) (Avg total: 14.1s, Max total: 160s)

Execution count: 9726

Job / Rule	Last run	Last exec time	Exec count	Avg/Max Exec time
acquia_agent_cron	- [run]			
1 4 * * *	08/19/2014 - 04:01	0s	8	0.25s / 1s
acquia_spi_cron	- [run]			
2 4 * * *	08/19/2014 - 04:02	13s	8	15.87s / 36s
apachesolr_cron	[run]			

4.   DL Integration Points

This section provides a description of the various DL integration points as well as how specific elements are currently configured.

4.1 Shared Services

4.1.1 SSO

The SSO is currently implemented using the XMLSeclibs library, for which the documentation can be found here, https://code.google.com/p/xmlseclibs/. The current version, as of writing, is 1.3.1. The module that is used on the Drupal end is the sbac_sso module. The module accepts incoming requests from the SSO system and validates the assertion using the XMLseclibs library.

4.1.2 Program Management

The Program Management API is implemented using the PHP cURL Library. The server must have the PHP cURL library installed in order for this to operate, instructions on this process can be found here, http://php.net/manual/en/book.curl.php. The API is called using the URL, https://pm.smarterbalanced.org/rest/tenantchain and can accept the following query parameters "STATE_GROUP", "STATE", "DISTRICT_GROUP", "DISTRICT", "INSTITUTION_GROUP" and "INSTITUTION". The API does not require all the parameters however, if no parameters are given, an empty result is provided back. The more parameters are provided, the more defined the API results are returned. The result set returned is formatted in a JSON response format. Every 3 hours the Program Management API is called to retrieve the tenant list using https://pm.smarterbalanced.org/rest/tenants. This list is stored in the database layer to reduce calls to the API. If a user attempts to login to Drupal site the application will check the cached result set first, if not found, the API will be called with the above parameters.

4.1.3 Core Standards

The Core Standards is implemented using the PHP cURL Library. The server must have the PHP cURL library installed in order for this to operate, instructions on this process can be found here, http://php.net/manual/en/book.curl.php. The API is called using the URL, https://cs.smarterbalanced.org/corestandards/api/. The API requires query parameters to return a result. All results are returned in the JSON format. The initial request is to return the publication key for ELA and MA. Examples of those calls include https://cs.smarterbalanced.org/corestandards/api/publication?publisher=CC&subject=ELA and

https://cs.smarterbalanced.org/corestandards/api/publication?publisher=CC&subject=MA.
The data from those two requests is then used to get the dataset for each subject. The next
two requests are
https://cs.smarterbalanced.org/corestandards/api/publication/CC-ELA-v1/standard and
https://cs.smarterbalanced.org/corestandards/api/publication/CC-Ma-v1/standard. The
data returned here is then parsed and saved into the Drupal site.

4.1.4 Learning Registry

A group of Learning Registry modules are used for site admins to be able to publish
content to the Learning Registry: learning_registry, learning_resource_metadata_initiative,
and nysed_lri. The modules' specific functions are described below along with directions
for accessing them for additional configuration.

4.1.4.1 Learning Registry Module

The Learning Registry module provides the core connection to the sandbox Learning
Registry. It currently supports OAuth authentication in order to publish documents to the
Learning Registry. The modules' settings are accessible via the Drupal admin menu:
Configure -> Services -> Learning Registry.

From there, the admin can configure the learning registry URL, which, by default is the
sandbox Learning Registry URL. The admin can also configure the OAuth secret token and
key in order to properly authenticate when publish documents to the Learning Registry.
Other properties that can be configured are publisher, terms of service URL and privacy
policy URL. This module was modified to allow the CMS to use the LRMI schema rather
than the Dublin core schema only. Rather than a hardcoded schema implementation, the
CMS includes custom code that allows other modules to create a custom schema.

4.1.4.2 Learning Resource Metadata Initiative Module

This module is responsible for creating JSON representations of published content in order
to send the documents to the Learning Registry. The module uses the LRMI schema as a
base to represent the metadata of the published content, which is then indexed by the
learning registry index. The module functions are called by the learning_registry module
when documents are being processed and constructed before being sent to the learning
registry. This module provides no configuration UI and can be modified only by editing the
module's code directly: sites/all/modules/custom/learning_resource_metadata_initiative.

The module currently takes all tags and applies them to the keys attributes within the document. Alignment objects are currently not used within this module, but can be added via modifying the modules' payload function. The payload function is the function responsible for constructing the JSON representation of the published content that is to be sent to the learning registry.

4.1.4.3 SBAC_learning_registry Module

The sbac_learning_registry module provides the functionality to interface with the Learning Registry Index (LRI). The module uses a REST call to the LRI in order to search the LRIs' Apache Solr index to retrieve the results. The module has no configuration for it and all modifications need to be done through the modules' code. It is also responsible for altering documents in order to add paradata information regarding the content being published to the Learning Registry. The module currently propagates the number of likes and views of a resource. The module supports the delete command and removes the resource from the learning registry. As of this writing, the module does not support the update command, to update resources existing in the learning registry. The module also adds extra validation to ensure all tags are properly set before any nodes are published to the learning registry.

5.   Other Considerations

5.1 Security

Table 7: Security Matrix

Function	Page	Unauthenticated	Authenticated (Educator)	System Admin
Web Browser Access to CMS application	All		X	X
Generate deep linking to the content	All		X	X
View linked content	All		X	X
Viewing shared links to the content	Shared Resource Page(s)	X	X	X
Login / Site Access (SSO with Shared Services Portal)	Login Page	X	X	X

As part of the Digital Library project, Amplify completed information security audits in advance of each Digital Library release. These audits typically included the following types of tests: security code review and web application penetration testing which focused on the

changes made for any given code release. This involved a combination of manual and automated techniques to attempt to circumvent an application's permission model to undermine the confidentiality, integrity, or availability of data. The audits did not include review of operational controls or hosting environments. We recommend that SBAC continue to follow standard industry practices for secure application development and operations going forward. The following link references the SAS 70 / SSAE 16 SOC1 standards in place on Acquia infrastructure: https://docs.acquia.com/cloud/arch/compliance-standards-and-regulations.

5.2 Performance & Scalability

Site responsiveness and performance will depend on several factors such as network utilization, number of simultaneous users, hardware used for deployment or caching layer used. Unauthenticated users browsing public resources may experience faster load times than the authenticated users due to amount of dynamic content that needs to be generated for each page load for the authenticated users. Public resources and anonymous users will utilize Varnish cache to speed up the page generation.

Scaling is controlled by the dedicated Acquia representative for the account. As technical contacts, users can see the current configuration of the servers here:https://insight.acquia.com/cloud/servers?s=1078366. Through performance testing we created a formula that can be used to calculate infrastructure requirements. These requirements can then applied by Acquia for a specific amount of incoming requests.

5.3 Availability

Uptime SLAs are available from Acquia and are based upon the final production subscription chosen. Acquia SLAs can be found here: https://www.acquia.com/search-sla

5.4 Logging / Auditability

Acquia monitor system logs as part of the subscription. Log files can be downloaded through the Cloud UI: https://insight.acquia.com/cloud/paths?s=1078366. New Relic is an add

on provided by Acquia out of the box that provides real time diagnosis of server responses. In the first three months a Pro account is provided after that, the account is lowered to the Standard account.

5.5 Accessibility / Special Needs

The DL meets requirements of the WCAG 2.0 A and Section 508 of the Accessibility Act.

5.6 Application systems Control and Auditability

Administrative interfaces are through the Acquia dashboard. Only authorized IT/support users have access to the dashboard: https://docs.acquia.com/cloud/configure.

6. Code Review

Internal code reviews are done using the GitLab repository management tool. The platform allows for the lead developer on the project to review code before pushing the changes to the Acquia hosted repository. As a developer they will create a feature / bugfix branch to work locally, once complete, the code is committed and a merge request is activated to alert the lead developer that they need to review the code updates. The lead developer then has the opportunity to review changes and either accept or reject. If rejecting the developer can add comments to each line of code specifying what was wrong and how to fix the issue. Then the developer can go back and fix the issues, submit another merge request where the process can then be iterated upon. Once the lead developer accepts the changes with the code commit, he/she can merge the code into the head of the repository and trigger a deploy that will push the changes from the internal GitLab repository to the Acquia hosted repository. Each environment on Acquia is configured to a specific branch and pushes from the GitLab repository branch go to the aligned Acquia branch. During any given sprint, an average of fifteen code reviews were performed before any code was allowed to go live in the Acquia hosted repository. As well, subsequent QA is performed on the code changes before being pushed to staging or production environments.

7. Appendix A

DL Requirements

Table 9: List of Requirements

Requirement Text
System must allow administrative users to access user IDs and passwords and email them to authorized recipients
As part of the user registration process, the Digital Library application will disseminate the acceptable use policies and track user acknowledgement of the acceptable use policies. The process is enforced in the License and Use Policy Acknowledgement module. This

applies to both registered and unregistered users. For registered users, the module will re-certify user acknowledgement upon user login if the acceptable policies change after previous acknowledgement. For unregistered users, access to the resources will be limite and restricted.
As part of the user registration process, the Digital Library application will disseminate the acceptable use policies and track user acknowledgement of the acceptable use policies. The process is enforced in the License and Use Policy Acknowledgement module. This applies to both registered and unregistered users. For registered users, the module will re-certify user acknowledgement upon user login if the acceptable policies change after previous acknowledgement. For unregistered users, access to the resources will be limited and restricted.
As part of the user registration process, the Digital Library application will disseminate the acceptable use policies and track user acknowledgement of the acceptable use policies. The process is enforced in the License and Use Policy Acknowledgement module. This applies to both registered and unregistered users. For registered users, the module will re-certify user acknowledgement upon user login if the acceptable policies change after previous acknowledgement. For unregistered users, access to the resources will be limited and restricted.
As part of the user registration process, the Digital Library application will disseminate the acceptable use policies and track user acknowledgement of the acceptable use policies. The process is enforced in the License and Use Policy Acknowledgement module. This applies to both registered and unregistered users. For registered users, the module will re-certify user acknowledgement upon user login if the acceptable policies change after previous acknowledgement. For unregistered users, access to the resources will be limited and restricted.
System provides users with context aware search and tagging capabilities, as well as browsing by keyword, grade, content area, resource type, etc.
System provides robust content management user interface (several different options for viewing & organizing materials, i.e., thumbnail view, etc.), organized in a simple and intuitiv way
System provides users with context aware search and tagging capabilities, as well as browsing by keyword, grade, content area, resource type, etc.
User comments are an integral feature and process to allow users to improve the quality of content and to communicate effectively through the collaborative authoring process. Users will be able to search/query previously entered comments as part of search and filter operations. The user comments associated with specific learning resources can also be

exported as part of a digital asset package.
The Digital Library search, navigation, and tagging system is coordinated with an item tagging system to allow for a link between score results that may be reported by grade level, content area, claim, and target on the interim assessment and educator, parent, or student resources that may be related to the same grade level, content area, claim, and target. In addition, users are able to search by key words and tags aligned to national resource networks.
The Digital Library search, navigation, and tagging system is coordinated with an item tagging system to allow for a link between score results that may be reported by grade level, content area, claim, and target on the interim assessment and educator, parent, or student resources that may be related to the same grade level, content area, claim, and target. In addition, users are able to search by key words and tags aligned to national resource networks. [PRO 69] In addition to serve the internal content management workflow, the tagging components would support the following two needs: 1) to connect assessment reporting categories with resources to improve teaching and learning and 2) to search resources based on content/grade/topic categories including, but not limited to formative assessment practices, strategies, and tools. The Digital Library tagging components will leverage 3 key sets of standards: LRMI meta-data standard; Assessment to CCSS (Common Core State Standards) meta-data standards currently being defined by SIF and IMS Global for PARCC and Smarter Balanced; and CCSS taxonomy hosted by the NGA Center and CCSSO. The tagging system will adopt both the taxonomy structure for authoring/displaying and the meta-data structure to internally store and map resources.
Wireless Generation will implement an efficient process for an authorized administrator to edit, update, and remove resources.
Similar to the "normal" CMS process but with extended support for batch uploading and removal, the system will provide appropriate editorial review for each resource and the overall permission process.
Similar to the "normal" CMS process but with extended support for batch uploading and

removal, the system will provide appropriate editorial review for each resource and the overall permission process.
System supports storage of various media types
System supports media delivery / content preview functionality System allows for integration with social media platforms & Web 2.0 resources (i.e., YouTube, SlideShare, & Flickr)
● System is capable of displaying copyrights and attributions
System supports media delivery / content preview functionality
The Digital Library is "an interactive teacher professional development tool to monitor professional learning goals. Teachers will primarily use this component to access resource for their own professional development. This will include resources such as documents, videos, guides, sample summative/interim tests and responses, and forums. Teachers can customize their content, post their reflections, and monitor their progress on implementing new practices.
Each module in the Assessment Literacy tutorials will contain interactive content that will ta between 5 and 15 minutes to complete. Content will have a combination of embedded videos, voice overs, quizzes, reflection questions, and text for teachers to interact with.
Each module will have printable guides and rubrics that teachers and PLCs can use to evaluate their own lesson plans, instruction, and assessments.
Following the development strategy definition, we will use an agile development method involving the Digital Library Review Board, Work Groups, State Leads, State Leadership Teams, and State Networks of Educators to incorporate their feedback on the list of resource attributes and the proposed set of required tags for resources in the Digital Librar
Following the development strategy definition, we will use an agile development method involving the Digital Library Review Board, Work Groups, State Leads, State Leadership Teams, and State Networks of Educators to incorporate their feedback on the list of resource attributes and the proposed set of required tags for resources in the Digital Librar
System provides users with context aware search and tagging capabilities, as well as browsing by keyword, grade, content area, resource type, etc.
System allows user rating and commentary on resources (RFP 77 - M) Instead, we plan to track system-generated metadata and paradata, such as usage statistics, user behavior trace, moderator actions, group participation rate, links, quotations references and relationships among resources. All of this will be tracked in addition to user generated content such as comments, ratings of content submitted by users, and like/unlik counts. We can then utilize such data to derive and facilitate the contributor rating, kudos, recognitions and even more formal CONSORTIUM-wide communal feedback. (PRO 37)

System provides descriptive statistics regarding user feedback and popularity
System allows user rating and commentary on resources
System provides users moderated collaboration tools (i.e., wikis, discussion boards, etc.)
System provides users moderated collaboration tools (i.e., wikis, discussion boards, etc.)
During the rollout of the first two sets of modules in August 2013 and February 2014, we w create, manage and monitor a database that will track comments by teachers about each c the instructional modules and also the improvements made to the Digital Library. By the Ju 2014 final delivery date, Wireless Generation will have made adjustments and improvemer to the modules, based on the feedback. As part of each module's professional learning materials, a link will be provided to take educators to an online site where they can submit comments throughout the rollout time span.
System allows users to track user favorites & sharing of end-user libraries
Administrator User Guide, End-User Guide, State Implementation Guide
System provides static and interactive materials (tutorials, help-text, user-guides, etc.) to help users navigate and use the features of the Digital Library
The Assessment Glossary will contain a comprehensive list of key terms and definitions tha develop educators' understanding of and ability to use assessment terminology to improve teaching and learning. The Assessment Glossary will ensure that educators have easy access to a comprehensive set of terms related to assessment literacy. It will be created w context-sensitive help, so that users can pull up definitions in the context of the work they a doing at any given point.
System provides users mobile access capabilities
System must provide usage statistics at, minimally, the individual user level
System has the ability to track user login and report access activities
On-demand administrative reports
Instead, we plan to track system-generated metadata and paradata, such as usage statistics, user behavior trace, moderator actions, group participation rate, links, quotations references and relationships among resources. All of this will be tracked in addition to user generated content such as comments, ratings of content submitted by users, and like/unlik counts. We can then utilize such data to derive and facilitate the contributor rating, kudos, recognitions and even more formal CONSORTIUM-wide communal feedback.
As required in the RFP, we will provide monthly statistics to the State Leadership Teams (starting January 2014 and continuing through the life of the contract), analyzing the numbe of resources recommended and approved, by state, to the Digital Library. Utilizing log records and system metrics, it will be possible to track number and type of uploaded resources, participants and dates of usage.

User comments are an integral feature and process to allow users to improve the quality of content and to communicate effectively through the collaborative authoring process. Users will be able to search/query previously entered comments as part of search and filter operations. The user comments associated with specific learning resources can also be exported as part of a digital asset package.
System functionality can be granted or restricted to user groups or entities
System functionality can be granted or restricted for administrative groups and users
System allows for groups and entities to be defined in a flexible, tiered manner with no preset limit to tiers
System must allow administrative users to add, modify, or delete groups and individual users
System must allow administrative users to define groups and assign permissions/constraints/functions to those groups (including permissions/constraints for administrative groups and users)
System must allow administrative users to enable or disable access for groups and individual users
System must allow administrative users to search for groups and users by name or other associated metadata
System functionality can be granted or restricted for administrative groups and users
System must allow administrative users to add, modify, or delete groups and individual users
System must allow administrative users to enable or disable access for groups and individual users
System must allow administrative users to search for groups and users by name or other associated metadata
Depending on the type and scope of a given business process, state entities, districts, or individual schools may access the following types of information through Digital Library that might have privacy implications: Teacher and educator profile data (names, e-mail addresses, telephone and fax numbers, grades; state, school, school district, and classroom associations); Observational assessment records or scores; Comment and notes on performance/needs and instructional strategies.
System must meet Section 508 requirements for all features, navigation pages, utilities, reports, system-generated documents (e.g., Word, Excel, and PDF), query results, and other information generated by the system

Additionally, the Digital Library also contains a work area to guide teachers to identify and use the best resources for their needs. The system may also be able to use the teacher's interaction with the system to suggest additional resources."
For any hosting proposals, the VENDOR provides effective physical security measures for all proposed equipment sites, all processing and operations areas, and secured storage areas
The VENDOR has a current annual security rating from an independent third party auditing firm that certifies that the VENDOR meets federal guidelines and in subsequent years will certify the meeting of the CONSORTIUM'S guidelines for the handling of confidential data
System provides user provisioning and subscription-based access
System integrates with Single Sign On (SSO) and Portal as outlined in the Smarter Balanced IT Systems Architecture
Integration of the Digital Library system with other CONSORTIUM platforms so that resources can be referred to and used in other CONSORTIUM applications (for example, exemplar resources)
Integration of the Digital Library with external digital learning resource repositories such as those procured by the States. Optionally, Integration of Digital Library component with learningregistry.org for content tagging and aggregation
System meets all of the functional requirements, and will be provided to Smarter Balanced member states with irrevocable or open-license source agreement
Development of interoperability standards and services to facilitate import and export of data to and from state systems.
The application will support recoverability using commonly available and industry standard backup applications and approaches, including the ability to: - provide point-in-time recovery of data to the last completed transaction - allow for continued use of the system during backup - provide a complete backup and recovery process for all database tables and system files
The backup and archival features of the system proposed can be initiated automatically or manual request
System uses real-time replication so that testing is not interrupted during fail-over
System is able to route data to multiple data centers distributed across the United States
System features 24-hour availability daily with advance notification of downtimes
System is able to support cloud-based hosting services
The proposed system shall operate efficiently with the CONSORTIUM's minimum software and hardware specifications

http://www.smarterbalanced.org/smarter-balanced-assessments/technology/#itsystems
System is fully self-contained and capable of being operated by the CONSORTIUM with no dependency on VENDOR services for its routine operation
The Digital Library will be designed as a fully integrated part of Smarter Balanced IT systems' technology solutions and is designed and built in accordance with established CONSORTIUM-approved IT systems and standards.
System is able to check end-user computers to ensure that they have the components necessary to view reports and/or access system features

8. Appendix B

Table 8: List of Drupal Contrib Modules

Module Name	Links/Patches	Version	Group
Administration menu (admin_menu)	https://www.drupal.org/project/admin_menu	7.x-3.0-rc4	Administration
Filter permissions (filter_perms)	https://www.drupal.org/project/filter_perms	7.x-1.0	Administration
Module filter (module_filter)	https://drupal.org/project/module_filter	7.x-1.8	Administration
Views Data Export (views_data_export)	https://www.drupal.org/project/views_data_export	7.x-3.0-beta7	Administration
Entity cache (entitycache)	https://drupal.org/project/entitycache	7.x-2.0	Caching
Comment goodness (comment_goodness)	https://www.drupal.org/project/comment_goodness	7.x-1.4	Collaboration
More Comments (morecomments)	https://www.drupal.org/project/morecomments	7.x-1.0-beta3+3-dev	Collaboration
Quicktabs (quicktabs)	https://www.drupal.org/project/quicktabs	7.x-3.6	Collaboration
Context (context)	https://www.drupal.org/project/context	7.x-3.2	Content Layout
Views (views)	https://drupal.org/project/views	7.x-3.8	Content Layout

Chosen (chosen)	https://drupal.org/project/chosen	7.x-2.0-alpha4	Content Type
Date (date)	https://drupal.org/project/date	7.x-2.7	Content Type
Date API (date_api)	https://drupal.org/project/date	7.x-2.7	Content Type
Date Popup (date_popup)	https://drupal.org/project/date	7.x-2.7	Content Type
Display Suite (ds)	https://www.drupal.org/project/ds	7.x-2.6	Content Type
Draggableviews (draggableviews)	https://drupal.org/project/draggableviews	7.x-2.0	Content Type
Entity Reference (entityreference)	https://drupal.org/project/entityreference	7.x-1.1	Content Type
Field collection (field_collection)	https://drupal.org/project/field_collection	7.x-1.0-beta7	Content Type
Fieldgroup (field_group)	https://drupal.org/project/field_group	7.x-1.4	Content Type
IMCE Wysiwyg API bridge (imce_wysiwyg)	https://www.drupal.org/project/imce_wysiwyg	7.x-1.0	Content Type
Label Help (label_help)	https://www.drupal.org/project/label_help	7.x-1.0	Content Type
Link (link)	https://www.drupal.org/project/link	7.x-1.2	Content Type
Maxlength (maxlength)	https://drupal.org/project/maxlength	7.x-3.0-beta1	Content Type
Phonetic Wordfilter (phonetic)	https://www.drupal.org/project/phonetic	7.x-2.0	Content Type

Publish Content (publishcontent)	https://www.drupal.org/project/publishcontent	7.x-1.3	Content Type
Title (title)	https://www.drupal.org/project/title	7.x-1.0-alpha7	Content Type
Workbench (workbench)	https://www.drupal.org/project/workbench	7.x-1.2	Content Type
Workbench Moderation (workbench_moderation)	https://www.drupal.org/project/workbench_moderation	7.x-1.3	Content Type
Wysiwyg (wysiwyg)	https://drupal.org/project/wysiwyg	7.x-2.2	Content Type
Pathauto (pathauto)	https://drupal.org/project/pathauto	7.x-1.2	Deep Linking
Libraries (libraries)	https://drupal.org/project/libraries	7.x-2.2	Dependency
Chaos tools (ctools)	https://drupal.org/project/ctools	7.x-1.4	Dependency
Token (token)	https://drupal.org/project/token	7.x-1.5	Dependency
Transliteration (transliteration)	https://drupal.org/project/transliteration	7.x-3.2	Dependency
Views UI (views_ui)	https://drupal.org/project/views	7.x-3.8	Dependency
X Autoload (xautoload)	https://www.drupal.org/project/xautoload	7.x-4.5	Dependancy
Features (features)	https://drupal.org/project/features	7.x-2.0	Deployment
FE Block (fe_block)	https://www.drupal.org/project/features_extra	7.x-1.0-beta1	Deployment
Strongarm (strongarm)	https://drupal.org/project/strongarm	7.x.2.0	Deployment

User Import (user_import)	https://www.drupal.org/project/user_import	7.x-2.2	Deployment
Dev Tools (devtools)	https://www.drupal.org/project/devtools	7.x-1.x-dev	Development
Dialog API (dialog)	https://www.drupal.org/project/dialog	7.x-1.x-dev	Development
Diff (diff)	https://www.drupal.org/project/diff	7.x-3.2	Development
Entity API (entity)	https://www.drupal.org/project/entity	7.x-1.5	Development
Entity Construction Kit (eck)	https://www.drupal.org/project/eck	7.x-2.0-rc2	Development
HTTP Parallel Request Library (httprl)	https://www.drupal.org/project/httprl	7.x-1.14	Development
Views fields combine (views_fields_combine)	https://www.drupal.org/project/views_fields_combine	7.x-1.2	Development
Voting API (votingapi)	https://drupal.org/project/votingapi	7.x-2.11	Development
Embedded Media Field (emfield)	https://www.drupal.org/project/emfield	7.x-1.0-alpha2	File Handling
File entity (file_entity)	https://drupal.org/project/file_entity	7.x-2.0-alpha3	File Handling
Google CDN	https://www.drupal.org/sandbox/teknic/2225051	7.x-1.0	File Handling
IMCE	https://www.drupal.org/project/imce	7.x-1.9	File Handling

Media (media)	https://drupal.org/project/media	7.x-2.0-alpha2	File Handling
Upload QC (upload_qc)	https://www.drupal.org/project/upload_qc	7.x-1.x-dev	File Handling
Lexicon (lexicon)	https://www.drupal.org/project/lexicon	7.x-1.10	Glossary
Learning Registry (learning_registry)	https://drupal.org/project/learning_registry	7.x-1.x-dev	Learning Registry
Legal (legal)	https://www.drupal.org/project/legal	7.x-1.5	Legal
Taskit (taskit)	https://www.drupal.org/project/taskit	7.x-1.0	Notifications
Fivestar (fivestar)	https://drupal.org/project/filvestar	7.x-2.1	Paradata
Google Analytics (googleanalytics)	https://drupal.org/project/googleanalytics	7.x-1.4	Paradata
Rate (rate)	https://drupal.org/project/rate	7.x-1.7	Paradata
Fast 404 (fast_404)	https://www.drupal.org/project/fast_404	7.x-1.3	Performance
Memcache (memcache)	https://www.drupal.org/project/memcache	7.x-1.1	Performance
PDF version (print_pdf)	https://www.drupal.org/project/print	7.x-1.3	Printing
Printer-friendly pages (print)	https://www.drupal.org/project/print	7.x-1.3	Printing
Views PDF Display (views_pdf)	https://www.drupal.org/project/views_pdf	7.x-1.3	Printing
Views Contextual Range Filter	https://www.drupal.org/project/contextual_range_filter	7.x-1.6	Reports

(contextual_range_f ilter)			
Acquia agent (acquia_agent)	https://drupal.org/project/acquia_co nnector	7.x-2.14	Search
Acquia search (acquia_search)	https://drupal.org/project/acquia_co nnector	7.x-2.14	Search
Acquia Search Multi Subscription (acquia_search_m ulti_subs)	https://www.drupal.org/project/acqu ia_search_multi_subs	7.x-1.1	Search
Acquia Site Profile Information (acquia_spi)	https://www.drupal.org/project/acqu ia_connector	7.x-2.14	Search
Apache Solr search attachments (apachesolr_attach ments)	https://www.drupal.org/project/apac hesolr_attachments	7.x-1.3	Search
Apache Solr framework (apachesolr)	https://drupal.org/project/apachesol r	7.x-1.6	Search
Apache Solr search (apachesolr_searc h)	https://drupal.org/project/apachesol r	7.x-1.6	Search
Apache Solr Users (apachesolr_user)	https://drupal.org/project/apachesol r_users	7.x-1.x-dev	Search
Apache Solr Views Integration (apachesolr_views)	https://drupal.org/project/apachesol r_views	7.x-1.0-beta 2	Search

Facet API (facetapi)	https://drupal.org/project/facetapi	7.x-1.3	Search
403 to 404 (m4032404)	https://www.drupal.org/project/m4032404	7.x-1.0-beta 2	Security
FlexSlider (flexslider)	https://www.drupal.org/project/flexslider	7.x-2.0-alph a3	Theming
jQuery Update (jquery_update)	https://drupal.org/project/jquery_update	7.x-2.4	Theming
Views Load More (views_load_more)	https://www.drupal.org/project/views_load_more	7.x-1.1+23-d ev	Theming
Zurb Joyride Context (joyride)	https://www.drupal.org/project/joyride	7.x-1.0-alph a2	Theming