

Test Item Bank – Level II Requirements

2012

I.	Introduction	3
II.	Terms and Definitions	3
III.	Assumptions.....	4
IV.	Issues.....	5
V.	Requirements.....	6
VI.	Data Transfer Listing	13

Test Item Bank – Level II Requirements

2012

Revision History

Revision Description	Author/Modifier	Version	Date
RADTIB.1.2 – added version to required metadata	Russ Hammond		December 28, 2012
RADTIB.1.5 – changed from error to alert RADTIB.1.6-8 – added new reqts for failure scenarios	Russ Hammond		December 31, 2012
<u>Section V.</u> Added RADTIB.1.1.3 RADTIB.1.1.4 RADTIB.1.9 RADTIB.1.10 Removed p-value, IRT from RADTIB.4.2 Changed: RADTIB.1.2, RADTIB.2.1, RADTIB.3.3 from error messages to alert messages RADTIB.4.1 – removed reference to Test Packager, added destination to list of input parameters. RADTIB.4.2 – removed p-value, IRT from fields, changed search results from APIP item to URI and searchable metadata values <u>Section I.</u> RADTIB.4.1 – added export destination to list of inputs to query Removed p-value, IRT from list of search data	Russ Hammond	1.7	January 15, 2013
Added metadata mappings to end of document	Russ Hammond	1.8	January 16, 2013
Added Difficulty to searchable metadata	Russ Hammond	1.9	January 24, 2013

2012

I. Introduction

1. The overall responsibilities of this component are:
 - a. Storing and retrieving assessment items.
 - b. Storing and retrieving assets and metadata related to the assessment items.
 - c. Tracking item versioning.
 - d. Tracking item lineage. (If an item changes to such an extent that it becomes a new item, the lineage tracks what the item used to be.)
 - e. Providing a robust search and query capability that allows searching on 12 metadata fields:
 - i. Item Type
 - ii. Item Identifier
 - iii. Item Status
 - iv. Item Keywords
 - v. Grade
 - vi. Subject
 - vii. Subject subcategory
 - ~~viii. P-values~~
 - ~~ix. IRT values~~
 - x. Item Difficulty
 - xi. Writer
 - xii. Source

II. Terms and Definitions

Term	Definition
APIP	Accessible Portable Item Profile. A technical standard that focuses on accessibility in assessment items.
Asset	Multimedia (digital text, images, audio and video) associated with an item
Blueprint	The design for a test. The test blueprint indicates the number of test questions or points related to each competency on the test and the relative emphasis placed on each competency.
Field Test	Test made up of test items intended to develop and calibrate new assessments.
Grade Level	Grade or standard the item is designed for
Item	A question on a test. It may be composed of several parts including audio and visual files.
Item Author	A person or agency responsible for item creation.
Item Bank	A systems application that manages the storage and retrieval of assessment items, tracks item versioning and lineage, and provides a robust search and query capability that allows searching on all types of metadata.
Item Status	A term used to indicate how an item can be used. Some of the valid values are:

Test Item Bank – Level II Requirements

2012

	<ul style="list-style-type: none"> - Pilot Test - Field Test - Operational
JSON	JavaScript Object Notation, a lightweight, text based, open standard designed for human-readable data interchange.
Pilot Test	A trial series of new or modified items given to a select group of students.
Retired Item	An item that will no longer be used for an assessment.
Rubric	a guide listing specific criteria for grading or scoring academic papers, projects, or tests
Runtime exception	An unanticipated condition for which no error handling exists but normal processing cannot continue
Source Item Bank	The Item Bank from which an item is pushed to a Test Item Bank
Test	An instrument or procedure that proposes a sequence of tasks to which a student is to respond. The results are then used to form measures to define the relative value of the trait to which the test refers.
XML	Extensible Markup Language, a set of rules for encoding documents in machine-readable form.

III. Assumptions

	Assumption	Comments
1.	The Test Item Bank has no user face. It provides services to other components.	Any UI will be provided through Test Authoring.
2.	Items in the Test Item Bank are read-only.	
3.	Item versioning is associated with the original item identity.	
4.	Item versioning and version number assignment is done by Item Authoring.	Test Item Bank will not create new versions of existing items.
5.	The content source of Test Item Bank is the Item Bank.	
6.	Changes made to any item should originate from Item Bank with formal review and approval of concerned authorities.	
7.	Item validation is done at the item creation point or source.	
8.	Item contents are packaged in APIP Content Package Standard (This contains item, section and test content along with resources they	

Test Item Bank – Level II Requirements

2012

	point to...as we are storing only item content, we may not need section and test content as a part of the content package)	
9.	Data transfer between Item Bank to Test Item Bank will be an APIP/QTI package via FTP or RESTful interface.	
10.	None of the Test Item Bank items will be deleted. If they are not to be used, they will be retired.	Test items must be maintained so that the student test can be reconstructed and studied by psychometricians. Requirement RADTIB.3 below requires maintaining the lineage of an item.
11.	When Test Item Bank is queried by Test Authoring, the query will assume that the latest item version should be used for the test being constructed.	

IV. Issues

	Issue	Status	
1.	How will Item Bank push items to Test Item Bank, a zip file for single items, or a package of multiple? Will there be a manifest for checking item inventory? What will the manifest look like? What will the transport mechanism be, FTP? Will export be done as single and multiple?	Open	10/15/2012 – Manohar
2.	Who will own responsibility for the item APIP format validation?	Open	10/15/2012 – Manohar
3.	Can the IMS Global APIP validator be used for this project?	Open	10/15/2012 – Manohar
4.	How do Test Item Banks at differing levels of deployment interact? How are they registered and identified?	Open	11/7/2012 – Russ

2012

V. Requirements

Requirements are numbered according to the following convention:

- 1) RFP.## - a requirement from the RFP
- 2) RADTIB.## - a requirement from the detailed requirements from RFP-11 or the Architecture document
- 3) PRTIB.## - a requirement from the Proposal

Source.ID	Requirement	Category	Priority	Comments
RFP.9	Test Item Bank Component meets requirements detailed in the SBAC IT Systems Architecture (Appendix C). The detailed requirements below should cover the requirements from Appendix C.	General		
RADTIB.1	<p>The Test Item Bank is responsible for the storage and retrieval assessment items along with their assets and metadata. The Test Item Bank is required to store the following types of data associated to items.</p> <ul style="list-style-type: none"> • APIP Item Information • Item authoring details • Graphics • Scoring rubrics • Usage information and statistics • Version details • Help content • Audio files • Video files <p>Some of this content may be associated to the items within zip folders with the file paths contained in the APIP XML.</p>	Item Storage and Retrieval	High	
RADTIB.1.1	The Test Item Bank will store assessment items and the following data associated to an item:	Item Storage	High	

Test Item Bank – Level II Requirements

2012

	<ul style="list-style-type: none"> • APIP Item Information • Item authoring details • Graphics • Scoring rubrics • Usage information and statistics • Version details • Help content • Audio files • Video files <p>Some of this content may be associated to the items within zip folders with the file paths contained in the APIP XML.</p>			
RADTIB.1.1.1	The Test Item Bank must allow a single item to be inserted.	Item Storage	High	
RADTIB.1.1.2	The Test Item Bank must allow collections of items to be inserted.	Item Storage	Medium	The structure of a “collection of items” is TBD.
RADTIB.1.1.3	The Test Item Bank must be able to accept single items transferred via HTTPS.	Item Storage	High	
RADTIB.1.1.4	The Test Item Bank must be able to import items from an SFTP site	Item Storage	High	
RADTIB.1.2	<p>Any item to be added to the Test Item Bank must provide the following metadata:</p> <ul style="list-style-type: none"> • Item Type • Item Identifier • Item Version • Item Status (operational, field test) • Item Keywords • Grade (3, 4, 5, etc.) • Subject (Math, English) • Subject subcategory (geometry, arithmetic, etc.) • Writer • Source <p>If an item is to be inserted but does not contain all of the above metadata, an alert message will be logged that identifies the Test Item Bank, the source Item Bank and all of the existing item metadata</p>	Monitoring and Alerting	High	Rdh – 12-28-12 – added Item Version to required metadata

Test Item Bank – Level II Requirements

2012

	listed above with the message “Item cannot be added. Missing metadata”.			
RADTIB.1.3	Test Item Bank must timestamp inserted items and store the ID of the source Item Bank to provide an audit trail.	Item Storage	Medium	
RADTIB.1.4	Test Item Bank must generate an alert that indicates items were added to the Test Item Bank. The log message should identify the Test Item Bank, the number of items added, the ID of the source Item Bank, and the message “Item(s) added to Test Item Bank”.	Monitoring and Alerting	High	
RADTIB.1.5	If a database error occurs when adding a test item, an alert message will be generated. The message will identify the Test Item Bank, the Item ID, and the database error code and message.	Monitoring and Alerting	High	
RADTIB.1.6	If an item file to be imported cannot be opened, generate an alert message which identifies the file name, the Test Item Bank and the message “Invalid file format”.	Monitoring and Alerting	High	
RADTIB.1.7	If an item file to be imported has no manifest file, generate an alert message which identifies the file name, the Test Item Bank and the message “No Manifest File.”	Monitoring and Alerting	High	
RADTIB.1.8	If an item to be imported is missing a referenced resource file, do not add the item to the Test Item Bank. Generate an alert that identifies the item, the missing resource, and the Test Item Bank, with the message “Item Resource Missing”.	Monitoring and Alerting	High	
RADTIB.1.9	If an item to be imported has no corresponding metadata file, do not add the item to the Test Item Bank. Generate an alert that identifies the item and the Test Item Bank, with the message “Item Missing Metadata File.”	Monitoring and Alerting	High	
RADTIB.1.10	If multiple items in an import file share a common resource file, the association of items to the resource must be retained.	Item Storage	High	If a query returns the item’s content, it must include the shared resource. See RADTIB.4.1
RADTIB.2	The Test Item Bank will provide an interface that accepts items that have been marked operational or field test ready by the Item Bank (RFP #7).	Item Storage	High	Items will be pushed to the Test Item Bank.

Test Item Bank – Level II Requirements

2012

RADTIB.2.1	Test Item Bank will reject the addition of any item which is not marked operational or field test ready. An alert message will be logged that identifies the Test Item Bank, the rejected item ID and the ID of the source Item Bank with the message "Item cannot be added. Item not in ready status".	Monitoring and Alerting	High	
RADTIB.3	The Test Item Bank requires the ability to track versions of items that have been used on assessments including lineage.	Item Versioning	High	
RADTIB.3.1	The Test Item Bank will not allow the deletion of any version of an item.	Item Versioning	High	
RADTIB.3.2	When queried without a specified version, the Test Item Bank will provide the latest version of an item.	Item Versioning	High	
RADTIB.3.3	If an item to be added has an id matching an item already in the Test Item Bank and the version number of the item to be added is not greater than the existing item, the item will be rejected, and an alert will be issued. The alert message will identify the Test Item Bank, source Item Bank and item ID for the rejected item, with the message "Item cannot be added. Version number incompatible with Test Item Bank."	Monitoring and Alerting	Medium	
RADTIB.4	<p>The Test Item Bank will provide queries and functionality allowing the Test Authoring and Test Packaging components to query the correct versions of items for assessments with the assumption that the latest version should be displayed to the users of the Test Item Bank.</p> <ul style="list-style-type: none"> • The query will assume that the latest version should be used during the packaging process. <p>The Test Item Bank will interface with the Test Packaging component with the suggested input and output details.</p>	Item Retrieval	High	
RADTIB.4.1	The Test Item Bank will provide a query functionality which will require the item ID, item version, and destination for the exported item. The query will return the requested item in APIP format and any	Item Retrieval	High	Test Packaging must be able to pull the particular version of the item added to a test in Test Authoring.

2012

	associated resource files.			
RADTIB.4.2	<p>The query functionality provided to Test Authoring will return the latest version of an item. The query must allow searching by the following metadata:</p> <ul style="list-style-type: none"> - Item <ul style="list-style-type: none"> ✓ Item Type ✓ Item Identifier ✓ Item Status (operational, field test) ✓ Item Keywords - Item Standards <ul style="list-style-type: none"> ✓ Grade (3, 4, 5 etc..) ✓ Subject (Math, Science and Technology etc...) ✓ Subject sub category (geometry, arithmetic, and algebra etc...) - Item Statistics <ul style="list-style-type: none"> ✓ P-values ✓ IRT values ✓ Item Difficulty - Item Author <ul style="list-style-type: none"> ✓ Writer ✓ Source (teacher or consortium created etc...) <p>The result of the query will return a URI that can be used to retrieve the item and the values of all searchable metadata for the item.</p>	Item Retrieval	High	
RADTIB.4.3	When the Test Item Bank is queried, a log record will be written. The log record will identify the Test Item Bank, contain the search criteria and the number of records found matching the query. The message will also identify the time required to complete the query.	Monitoring and Alerting	High	
RADTIB.4.4	If a query of the Test Item Bank does not complete successfully, an error message will be logged. The message will identify the Test Item Bank, contain the search criteria and the database error code and	Monitoring and Alerting	High	

Test Item Bank – Level II Requirements

2012

	message.			
RADTIB.5	<p>The Test Item Bank will provide robust search and query capabilities of items that are ready to be presented on tests for the Smarter Balanced system.</p> <ul style="list-style-type: none"> The component will use RESTful APIs for all interfaces The component will leverage XML or JSON formatted messaging for interactions through the API interfaces <p>CLARIFICATION: The Test Item Bank will allow searches to be performed on the metadata items listed in RADTIB.4.2.</p>	Item Retrieval	High	<p>Clarification: The component will use either XML or JSON, but not both.</p> <p>See RADTIB.4.2 for the list of searchable metadata.</p>
RADTIB.6	<p>The Test Item Bank will provide search capabilities on item details limited to 10 fields:</p> <ul style="list-style-type: none"> Item Status (Operational, Field Test, etc.) Item Type (Multiple Choice, Constructed Response, Hot Spot, Cloze, etc.) Standards Grade Content Area Statistics (Item Difficulty, IRT values, p-value, etc.) — We need to confirm with Smarter Balanced which fields they would like to search for related to statistics Item Authoring Information (Author, Source, etc.) — We need to confirm with Smarter Balanced which fields they would like to search for related to authoring information Timestamps and Versions 	Item Retrieval		RADTIB.6 is superseded by RADTIB.4.2
RADTIB.7	The search criteria should be stored separately from the APIP XML storage to optimal performance. The search criteria may need to be parsed from the APIP XML during the import process.	Item Storage	High	
RADTIB.8	The Test Item Bank requires item authoring information from the Item Bank during the import	Item Storage		Superseded by RADTIB 1.2.

	process. The Item Bank needs to supply authoring information, such as the user who created the item, status (operational, field test, etc.), timestamps, etc.			This is an Item Bank requirement.
RADTIB.9	The Test Item Bank requires that the Item Bank component supply all of the items usage and statistical information that will be required for the purpose of Test Delivery and Test Assessment creation.	Item Storage		This is an Item Bank requirement.
PRTIB.1	<p>The Test Item Bank component will provide performance metrics, error logging, and work flow alerts to the monitoring and alerting component, using the framework specified in the Monitoring and Alerting component.</p> <p>Metrics:</p> <ul style="list-style-type: none"> • Performance statistics for queries for searching the Test Item Bank • Performance statistics for inserting items into the Test Item Bank (RFP #7) • Performance statistics for export interfaces to Test Packaging <p>Errors:</p> <ul style="list-style-type: none"> • Database transaction errors • API Interface errors (Request/Response) <p>Alerts:</p> <ul style="list-style-type: none"> • Not enough items available to fulfill a blueprint or specification is raised when a user runs the query to automatically select items for a test with a specific blueprint or specification • New items are available is raised when new items are released from the Item Bank to the Test Item Bank 	Monitoring and Alerting	High	<p>Clarification: Fulfilling a blueprint is a Test Authoring function.</p> <p>See the following reqts for monitoring and alerting:</p> <ul style="list-style-type: none"> • RADTIB.1.4 • RADTIB.1.5 • RADTIB.2.1 • RADTIB.3.3 • RADTIB.4.3 • RADTIB.4.4
PRTIB.1.1	Runtime exceptions will be written to the Monitoring and Alerting component.	Monitoring and Alerting	High	

2012

VI. Data Transfer Listing

Component Providing the Interface	Component Consuming the Interface	Input Data	Output Data	Data Format	Data Standard	Transfer Method	Notes/Description
Test Item Bank	Item Bank	Item details and supporting content	Item details and supporting content	XML/JSON	APIP	HTTPS	The Item Bank will push item content into the Test Item Bank (We need to discuss with Pacific Metrics on the data transfer)
Test Item Bank	Test Authoring	Item search parameters	Results	XML/JSON		RESTful API	The Test Item Bank will be searchable by 10 fields providing a small detailed listing about the items found
Test Item Bank	Test Authoring	Test specification parameter query	Results	XML/JSON		RESTful API	The Test Item Bank will be queried to determine if there are enough items to fulfill a test specification
Test Item Bank	Test Authoring	Item ID	Item details and supporting content	XML/JSON	APIP	RESTful API	The Test Item Bank will supply item details and content to the Test Authoring component that will ultimately be passed to the rendering component
Test Item Bank	Test Packager	Item ID	Item details and supporting content	XML/JSON	APIP	RESTful API	The Test Item Bank will provide item details to the Test Packager
Monitoring and Alerting	Test Item Bank	Alert		XML/JSON		RESTful API	The Test Item Bank will send alerts to the Monitoring and Alerting component
Monitoring and	Test Item Bank	Metrics		XML/JSON		RESTful API	The Test Item Bank will send metrics to the Monitoring and Alerting component

Test Item Bank – Level II Requirements

2012

Alerting							
Monitoring and Alerting	Test Item Bank	Errors		XML/JSON		RESTful API	The Test Item Bank will send error messages to the Monitoring and Alerting component
Monitoring and Alerting	Test Item Bank	Logs			log4j		The Test Item Bank will send logging events to the Monitoring and Alerting component

2012

Appendix A.

1. Required Metadata

Metadata	Tag in /metadata/item****.xml	Suggested Tag
Item Type	SYSTEM_ItemType	
Item ID	SYSTEM_ItemID	
Item Version	Missing – APIP examples have in manifest, but not in the manifest examples from	SYSTEM_ItemVersion
Item Status	SYSTEM_Status	
Item Keywords	Missing	SYSTEM_ItemKeywords
Grade	SYSTEM_Grade	
Subject	SYSTEM_Subject	
Subject Subcategory	Missing	SYSTEM_ItemSubcategory
Writer	SYSTEM_Author	
Source	Missing	SYSTEM_Source

2. Search Metadata

Metadata	Tag	
Item Type	SYSTEM_ItemType	
Item ID	SYSTEM_ItemID	

2012

Item Version	SYSTEM_ItemVersion	
Item Status	SYSTEM_Status	
Item Keywords	SYSTEM_ItemKeywords	
Grade	SYSTEM_Grade	
Subject	SYSTEM_Subject	
Subject Subcategory	SYSTEM_ItemSubcategory	
Writer	SYSTEM_Author	
Source	SYSTEM_Source	
Difficulty	SB_Difficulty	