The RAMLET project – Use cases

by the IEEE LTSC RAMLET Working Group

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1. Introduction

The LTSC Resource Models for Learning, Education, and Training (RAMLET) Working Group is undertaking a project to produce an IEEE standard that will define a conceptual model for digital aggregations of resources for learning, education, and training applications. The standard will facilitate interoperability by enabling the interpretation of external representations of resource aggregations and their properties. The standard will assume general means and methods for processing resource aggregates and will not address internal compositions, behaviors, or rendering of resources that make up resource aggregates. In addition to the standard, the RAMLET Working Group is developing five recommended practices that will provide mappings of aggregation formats to the conceptual model.

This document describes several use cases that were used to inform the approach to the development of the conceptual model that will described in the standard. Support for a given use case assumes that mappings of the associated aggregation formats to the conceptual model are available. Recommended practices planned for the IEEE 1484.13 series are IMS Content Packaging (IMS CP)[1], MPEG–21 Digital Item Declaration (DID)[2], Metadata Encoding and Transmission Standard (METS)[3], Atom Syndication Format (Atom)[4], and Open Archives Initiative Object Reuse and Exchange (OAI–ORE).[5]

The use cases discussed below are not exhaustive. The conceptual model could be applied to additional contexts in learning, education, and training assuming appropriate mappings for additional aggregation formats are developed.

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[1] IMS Specification, IMS Content Packaging, Version 1.1.4, Final Specification.
[2] ISO/IEC N4813, Information Technology – Multimedia Framework – Part 2 Digital Item Declaration.
[3] METS, Metadata Encoding and Transmission Standard: Primer and Reference Manual, Version 1.6, Revised. (See: http://www.loc.gov/standards/mets/METSPrimerRevised.pdf)
[4] Networking Group RFC 4287, The Atom Syndication Format. (See: http://tools.ietf.org/html/rfc4287)
[5] ORE Specifications and User Guides, Open Archives Initiative, October 2008. (See: http://www.openarchives.org/)

NOTE 1 – Use case support may be limited by the extent that equivalent capabilities exist in different resource aggregation specifications. As a result, mappings between aggregation formats may not be lossless.

NOTE 2 – Support for use cases is limited to interpretation of the aggregation formats using the conceptual model. Direct conversions between different aggregation formats are not supported.

NOTE 3 – The figures in this annex are intended to be high-level illustrations of data flows and are not intended to illustrate transactional procedures.

NOTE 4 – Digital resources, including other resource aggregations, may be imported into a resource aggregation either by inclusion or reference. A resource aggregation may contain only descriptions of digital resources and locators for resources and may not actually contain any resources.

2. Use case 1

Exchange and reuse of resource aggregations among systems using different specifications. For example, a system using METS might import resource aggregations that use IMS CP, MPEG–21 DID, and Atom and create a new resource aggregation.

2.1 Usage Scenario

A content author in a university is developing a new resource aggregation and wishes to include digital resources from different sources, including learning resources, reference materials, and research data. The author searches for appropriate materials and retrieves each digital resource to an authoring system. The resources are exported from their repositories in aggregation formats specific to their respective repositories. The authoring system interprets the incoming aggregation formats and converts them to its native format.

The author then creates the new resource aggregation, including the imported digital resources, and makes the new resource aggregation available to the local learning management system (LMS) or run-time system (RTS). The new resource aggregation is in the resource format used by the authoring system.

Figure 1 illustrates this scenario.

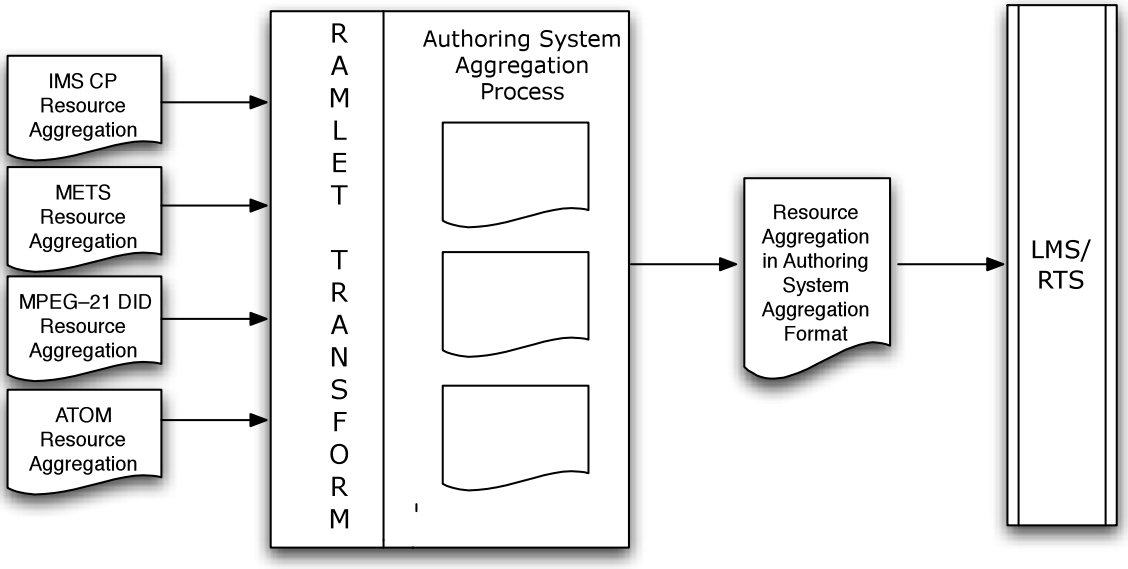

Figure 1 – Use case 1 usage scenario example

2.2 Use case summary: retrieve–interpret–aggregate–deploy

This use case addresses *retrieving* resource aggregations from diverse digital resource repositories that provide resource aggregations in different aggregation formats. The aggregation formats of the retrieved resource aggregations are *interpreted*, and transformed into a single aggregation format that can be used by an authoring system and then *aggregated* into a new resource aggregation. The new resource aggregation can be *deployed* by an RTS that is limited to a single aggregation format.

3. Use case 2

Exchange and reuse of individual digital resources of resource aggregations among systems using different aggregation formats. For example, a system using METS might import resource aggregations that use IMS CP, OAI–ORE, MPEG–21 DID, and Atom and create new aggregations from the digital resources from one or more of these resource aggregations.

3.1 Usage scenario

A content author in a university is developing a new resource aggregation and wishes to include digital resources from different sources, including learning resources, reference materials, and research data. The content author searches for appropriate materials. Some of these digital resources are parts of resource aggregations, but the author wishes to use the appropriate parts only and not the whole resource aggregation. The author retrieves each digital resource in its resource aggregation to an authoring system. The resources are exported from their repositories in aggregation formats specific to their respective reposi-

tories. The authoring system interprets the incoming aggregation formats and converts them to its native format.

The content author then creates the new resource aggregation, including complete imported resource aggregations and individual digital resources disaggregated from their parent resource aggregations. The author makes the new resource aggregation available to the local LMS. The new resource aggregation is in the aggregation format used by the authoring system.

Figure 2 illustrates this scenario.

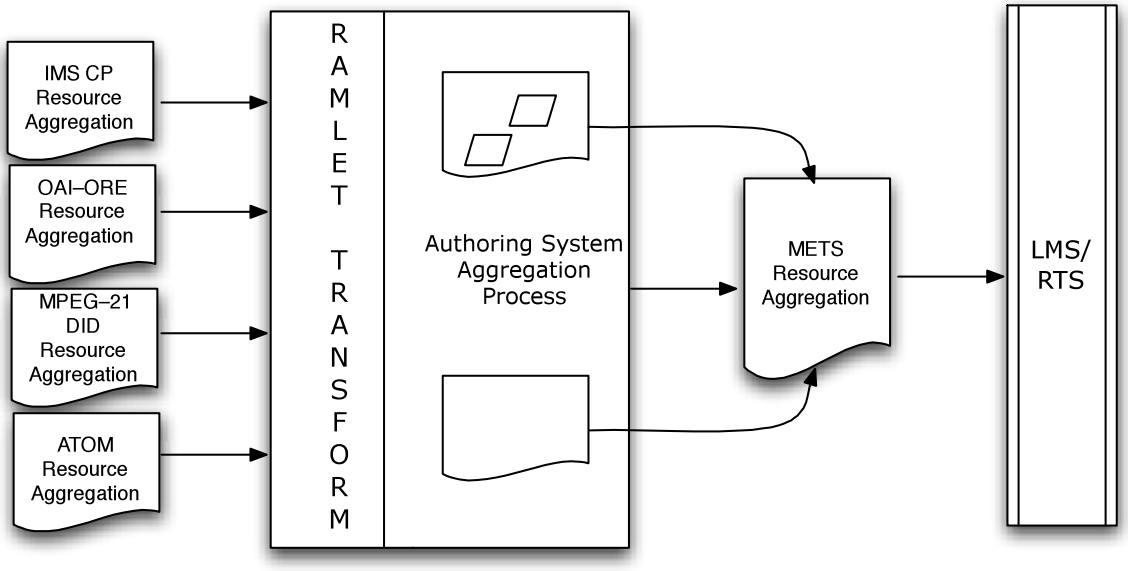

Figure 2 – Use case 2 usage scenario example

3.2 Use case summary: retrieve–interpret–disaggregate–aggregate–deploy

This use case addresses *retrieving* resource aggregations from diverse resource repositories that provide resource aggregations in different aggregation formats. The retrieved resource aggregations are *interpreted*, and converted into a single format that can be used by an authoring system. Some of the resources aggregations are *disaggregated* so that individual digital resources may be used. Resource aggregations and individual digital resources are then *aggregated* into a new resource aggregation. The new resource aggregation can be *deployed* by an LMS/RTS that is limited to a single aggregation format.

4. Use case 3

Import, store, and make available resource aggregations from systems using different specifications. For example, a system using METS might import resource aggrega-

tions that use IMS CP, OAI–ORE, Atom and MPEG–21 DID and store them in a single aggregation format.

4.1 Usage scenario

A librarian is helping a teacher collect digital resources that are relevant to the unit he or she is teaching and wishes to store the digital resources in a local repository for student access. They discover relevant digital resources in several different repositories and retrieve each digital resource. The digital resources are exported from their repositories in aggregation formats specific to their respective repositories. The local repository stores resource aggregations in a single aggregation format. Upon import to the local repository, the incoming aggregation formats are interpreted and the resource aggregations are stored in the aggregation format supported by the local repository.

Students are directed to the digital resources in the local repository by the teacher, and the access system is able to display the material using the aggregation format supported by the local repository.

Figure 3 illustrates this scenario.

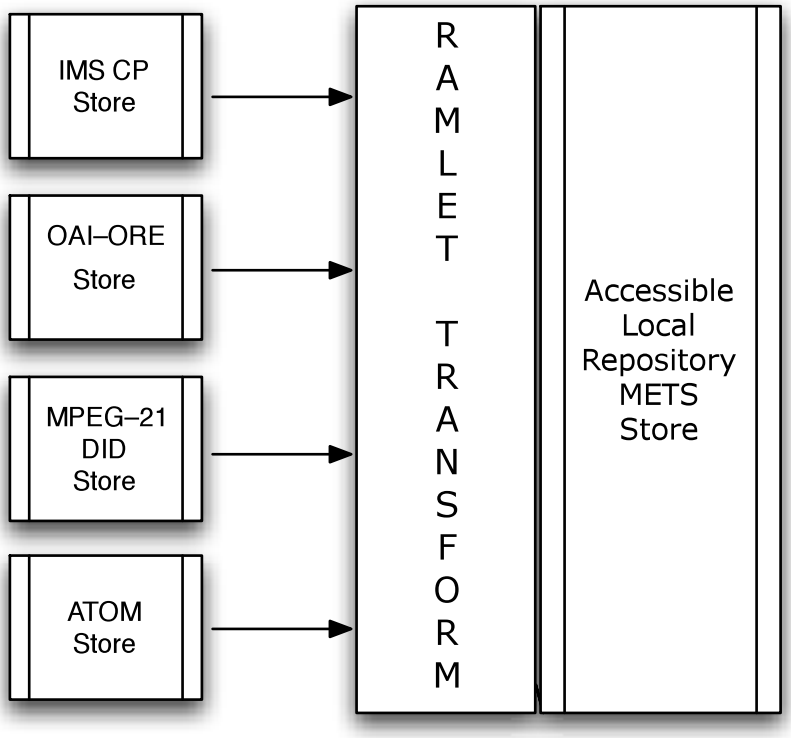

Figure 3 – Use case 3 usage scenario example

4.2 Use case summary: retrieve–interpret–store–provide

This use case addresses *retrieving* resource aggregations from diverse digital resource repositories that use different aggregation formats, *interpreting* the different formats, *storing* the resource aggregations in a single format, and *providing* the digital resource aggregations in a single format.

5. Use case 4

Import, store, and exchange resource aggregations from systems using different specifications. For example, a system using METS might import and export resource aggregations that use IMS CP, OAI–ORE and MPEG–21 DID in addition to METS.

5.1 Usage scenario

Resource suppliers provide digital resources to a resource exchange in the aggregation formats that are exported by their respective resource repositories, which may include different formats. Upon import to the resource exchange, the incoming aggregation formats are interpreted and converted to the specific aggregation format supported by the resource exchange.

Resource consumers search the resource exchange and download digital resources to their local systems. Upon download, a consumer can specify the aggregation format preferred by the consumer's local repository. Upon export, the resource repository converts its aggregation format to the format supported by the consumer's repository.

Figure 4 illustrates this scenario.

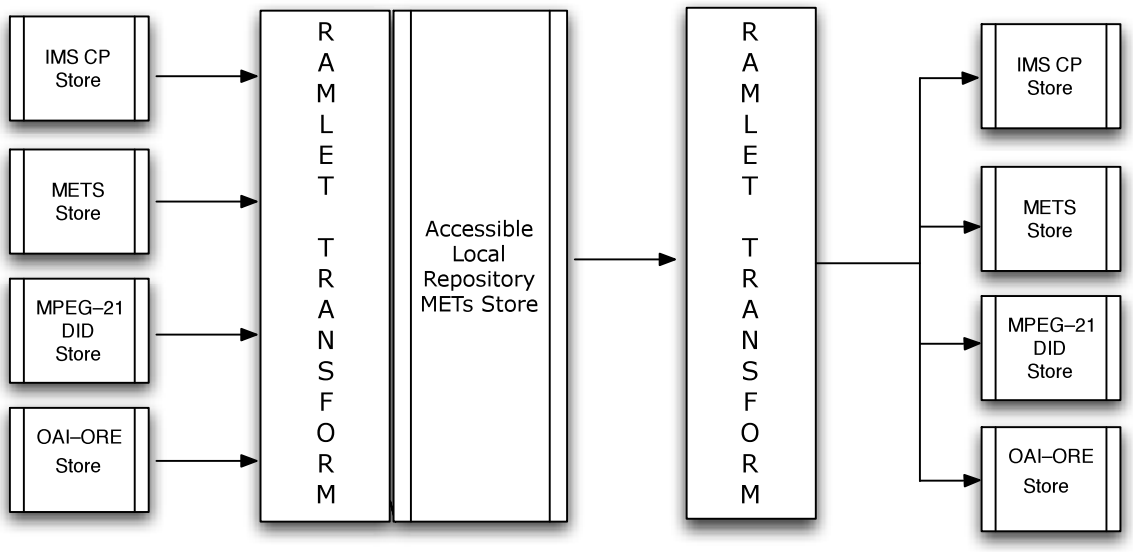

Figure 4 – Use case 4 usage scenario example

5.2 Use case summary: retrieve–interpret–store–interpret–provide

This use case addresses *retrieving* resource aggregations from diverse resource repositories that use different aggregation formats, *interpreting* the different formats, *storing* the resource aggregations in a single format, and providing the resource aggregations in multiple formats. When a resource aggregation is provided it will either be provided in the repository-specific format or *interpreted* and *provided* in the user's preferred aggregation format.

6. Use case 5

A repository stores resources in diverse aggregation formats but supports a delivery system that can render only one such format. For example, a repository might store resource aggregations that use IMS CP, MPEG–21 DID, OAI–ORE and the format used by a student-information store and support a delivery system that uses IMS CP, only.

6.1 Usage scenario

A content author is developing a new resource aggregation in an authoring system for an equipment manufacturer. The new resource aggregation will include several resources from different sources, including simulations, multimedia materials, and existing general learning resources (e.g., a digital resource describing an electrical safety procedure). The author searches for appropriate materials and retrieves each digital resource or resource aggregation, or a locator (e.g. a Uniform Resource Identifier [URI], Uniform Resource Name [URN], Uniform Resource Locator [URL], or other resolvable identifier) for the digital resource or resource aggregation into the authoring system. A digital resource or resource aggregation is either exported from its repository in the aggregation format used by that repository or is referenced and remains in the original repository in the original format. Imported resource aggregations retain their original aggregation formats.

The author creates the new resource aggregation, which includes the imported and referenced resource aggregations, and makes it available to the local LMS. When a student accesses the new resource aggregation in the LMS and uses one of its individual resource aggregations, the LMS/RTS interprets the individual aggregation format. The individual resource aggregation retains its format from the originating repository.

Figure 5 illustrates this scenario.

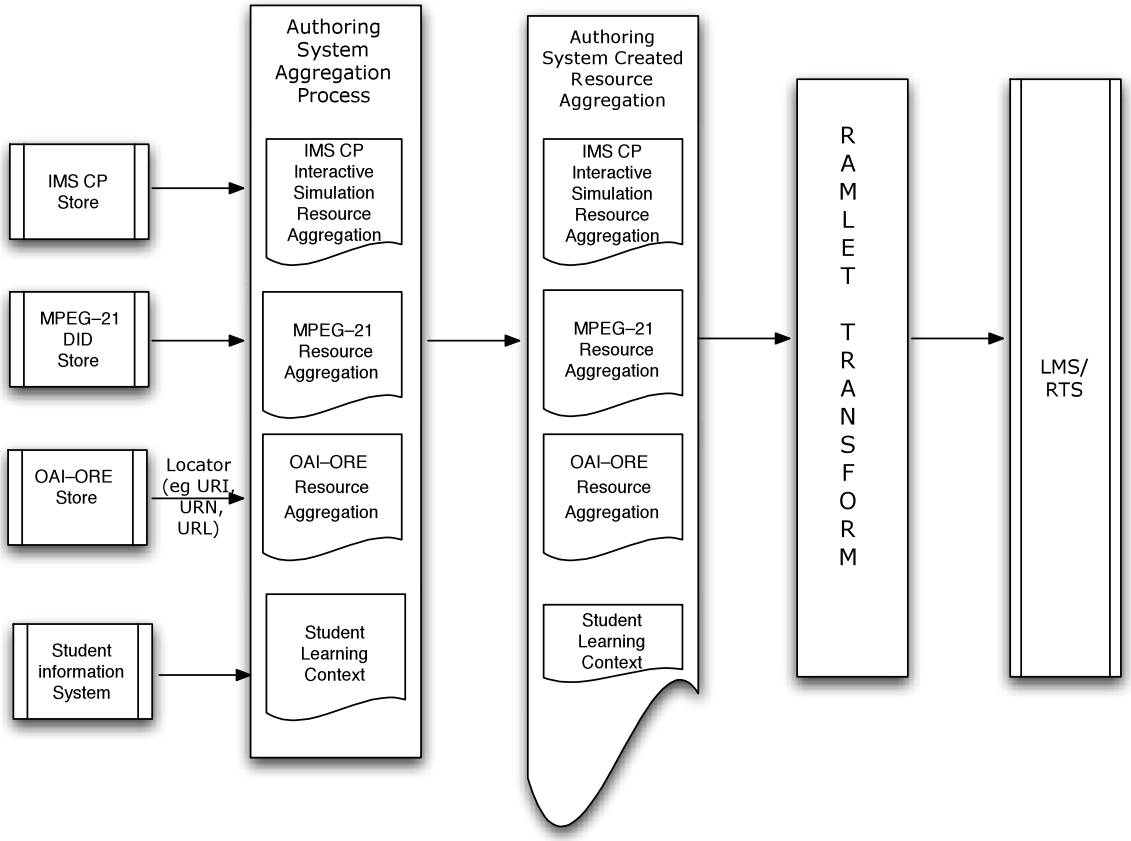

Figure 5 – Use case 5 usage scenario example

6.2 Use case summary: retrieve–aggregation–interpret–deploy

This use case addresses *retrieving* digital resources and resource aggregations, either directly or by reference, from diverse resource repositories that use different aggregation formats. These resource aggregations are *aggregated* into a new resource aggregation. They retain their original aggregation formats as parts of a larger resource aggregation. The individual resource aggregations are *interpreted* when they are *deployed* by an LMS/RTS that understands the repository's format and the formats used by the individual resource aggregations.

This use case is similar to use case, but the conversion takes place at run time. The original data is not altered.

NOTE – The amount of loss among the mappings may change over time as various resource aggregation specifications evolve. One advantage of run-time interpretation may be that a mapping done at a future time may be able to take advantage of improved mapping features.

7. Use case 6

An LMS creates a resource aggregation at run time, and will import, store, and make available to end-users, resource aggregations from systems using different specifications. For example, a system using its own internal format might import resource aggregations that use IMS CP, MPEG–21 DID, OAI–ORE and METS at the time they are required in the learning path.

7.1 Usage scenario

An LMS supports a learner by using and providing learning resources that are appropriate in the respective context of the learning situation and the individual requirements of the learner at a particular time. Such requirements may include accessibility preferences or needs in order to access the material. The LMS retrieves, provides, and aggregates required resources just in time and makes use of different sources that provide digital resources in different aggregation formats.

Figure 6 illustrates this scenario.

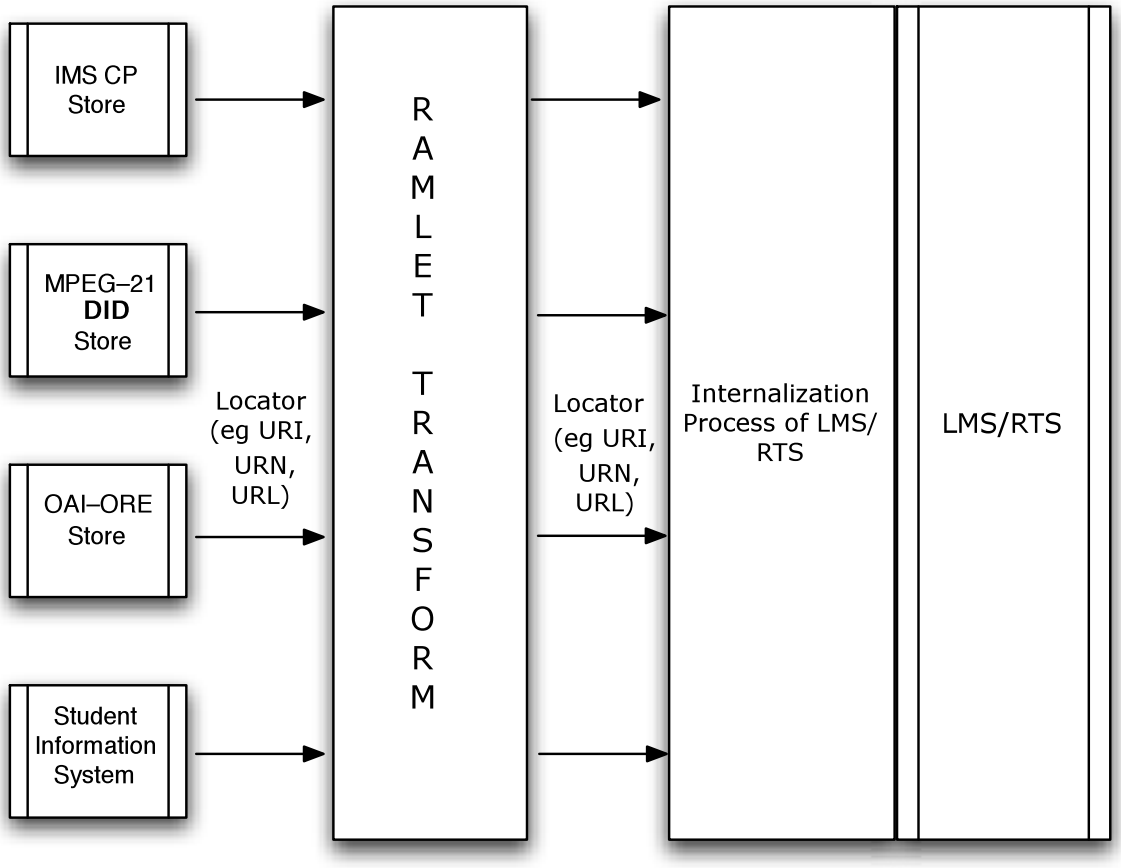

Figure 6 – Use case 6 usage scenario example

7.2 Use case summary: retrieve–interpret–internalize–deploy

This use case avoids building a complete resource aggregation prior to *deployment*. The conceptual model supports the transformation and *interpretation* of *retrieved* resource aggregations in diverse aggregation formats into a single format. The delivery system is able to produce an *internal* representation of the resource aggregation and render the resources.

8. Use case 7

Use of the conceptual model by system designers to inform an implementation of their internal aggregation formats. Resource aggregations would then be more easily convertible into other aggregation formats.

8.1 Usage scenario

A resource repository system designer is creating an internal aggregation format for a resource publisher. The publisher's customers have repositories that use different, repository-specific formats. The publisher's repository will provide a single resource aggregation in different formats depending on the customers' needs. Digital resources will be included in the resource aggregation by reference, only. Some resources will be held in the publisher's resource repository while others will be held and made accessible elsewhere on the Internet. By providing a resource aggregation that references resources, the publisher can ensure that the most current versions of the resources managed by the publisher are made available to the customer, include resources managed by third parties in the resource aggregation, and include open-access resources in the resource aggregation.

The designer uses the conceptual model to inform the design of the internal storage format to facilitate the conversion of resource aggregations from the publisher's internal format to other aggregation formats at the time of provision to the customer.

Figure 7 illustrates this scenario.

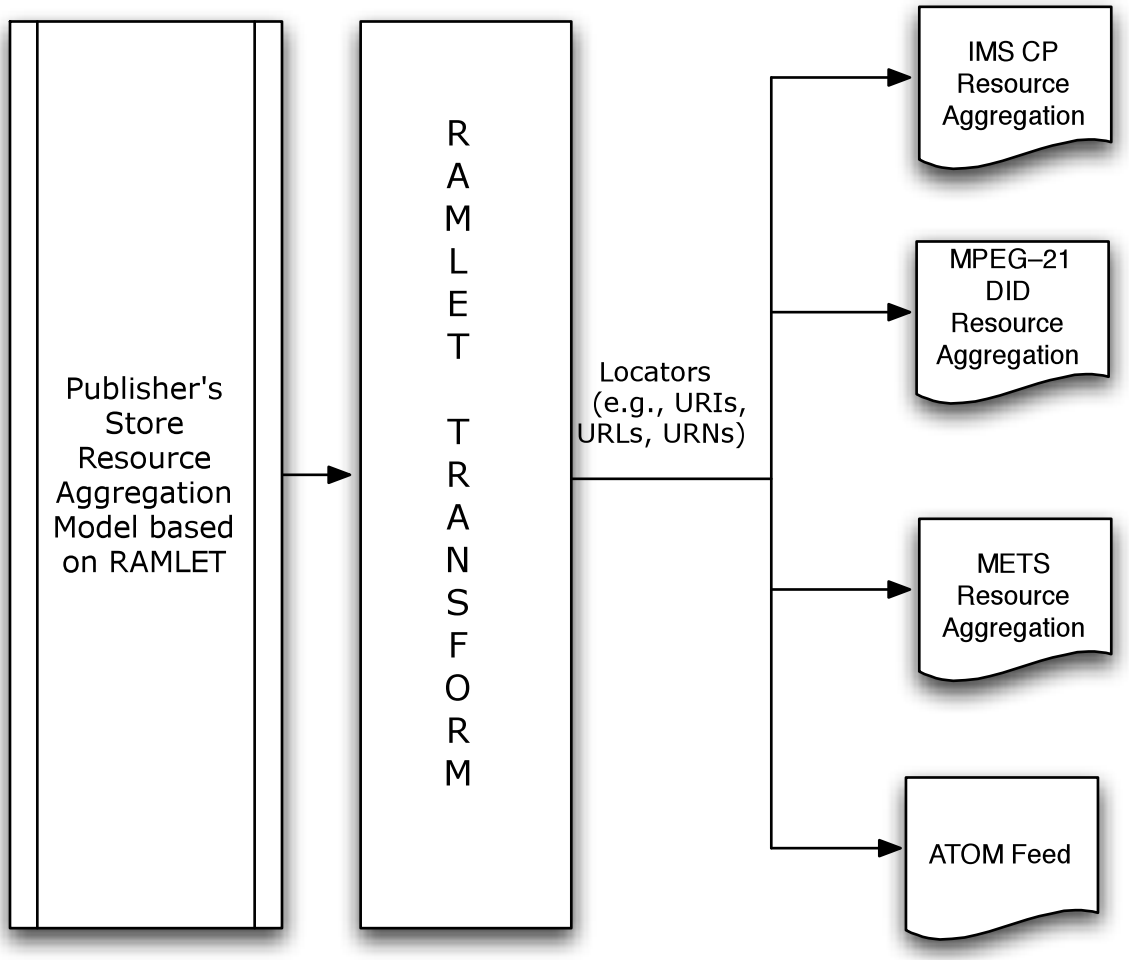

Figure 7 – Use case 7 usage scenario example

8.2 Use case summary: produce–store–provide–retrieve

This use case addresses the design of systems producing resource aggregations that will be provided to diverse repositories each of which may be limited to an aggregation format differing from the providing repository. Resource aggregations are *produced* and *stored* in a repository-specific format, but *provided* in the aggregation formats required by different consumers. Resources are *retrieved* from their home repository as required.

9. Use case 8

Extension of the useful scope of a resource aggregation by providing alternatives that adapt to different contexts, such as accessibility requirements or the limitations of individual delivery systems.

NOTE 1 – In all cases, some means of identifying and selecting the most appropriate alternative resource must be provided. This is beyond the scope of this standard.

NOTE 2 – Although the usage scenario below focuses on the provision of alternative resources to support the disabled, the ability to provide alternatives to a particular resource has wide application, including the provision of

- digital resources in a form suitable to a particular delivery device (e.g., an alternative version suitable for a mobile user accessing resources using a personal digital assistant [PDA]);
- digital resources in a form suitable to a particular environment, such as an audio equivalent for visual information that can be listened to while driving;
- digital resources that are "badged" appropriately for users' contexts (e.g., resources with army or navy badges);
- digital resources that match the access requirements of people with specific limitations or disabilities (e.g., alternative resources for the elderly); and
- the same digital resource in multiple languages.

9.1 Usage scenario

A specialized support teacher for the disabled in a university is working to support specific learners and tutors by improving the accessibility of resources originally created by tutors without specialized accessibility knowledge. The teacher is using a combination of software tools that report on accessibility properties of resources. She then uses human judgment to supply equivalent alternatives for those resources whose access properties have not been described in the resource aggregations. The alternatives are being provided for the dual purposes of making the resources accessible to learners in the local context in which they will be used and of making the resources more generally accessible to meet as wide a variety of contexts as possible.

The resulting outputs can contain multiple alternatives for some resource parts, each suiting different contexts, for example, to suit blind users and dyslexic users. The teacher creates some alternatives herself and also searches for and gathers available alternatives from repositories on the Internet. She then creates a new resource aggregation that contains the original resources authored by the tutors, the alternatives she has authored, and the alternatives obtained from repositories. She is careful to use the mechanisms the output aggregation format supports to record information that will enable the alternatives she has authored to be re-used in other organizations and contexts and to preserve that same information for the resources she has imported.

Figure 8 illustrates this scenario.

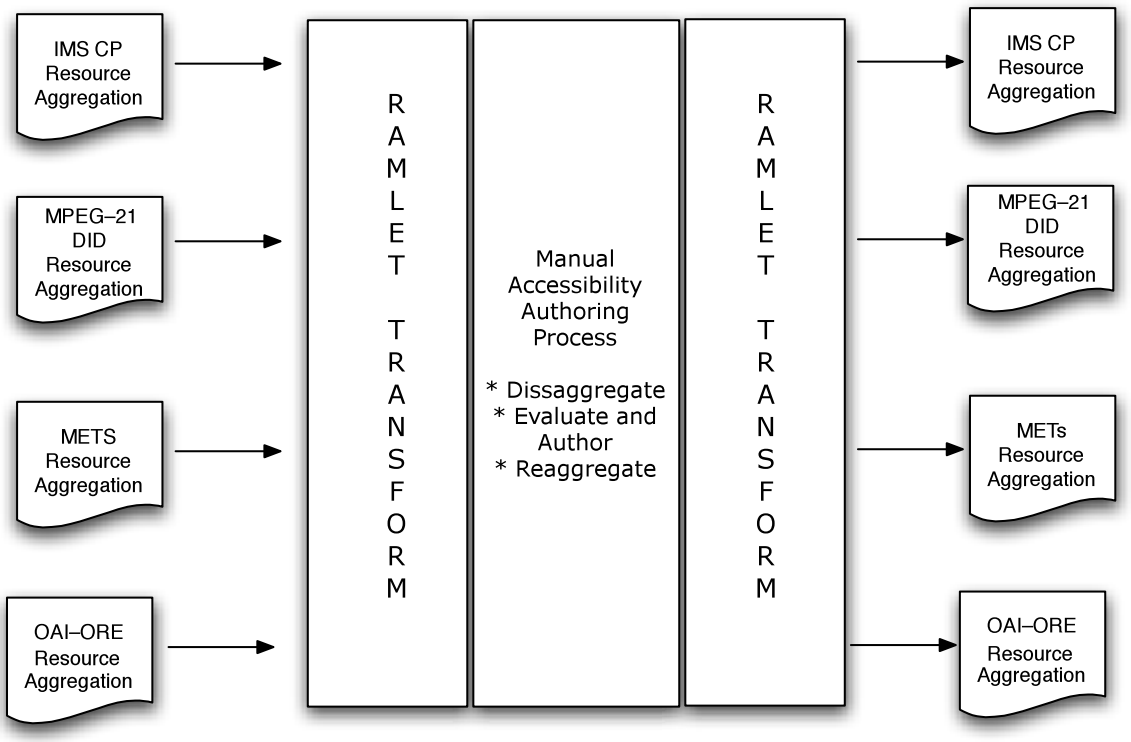

Figure 8 – Use case 8 usage scenario example

9.2 Use case summary: retrieve–interpret–disaggregate–evaluate–author–aggregate

This use case addresses *retrieving* resource aggregations from diverse resource repositories that provide resource aggregations in different aggregation formats. The retrieved resource aggregations are *interpreted* and converted into a single format that can be used by an authoring system. Some of the digital resources are *disaggregated*. After *evaluation* of the original resources, other digital resources are *authored*. Resource aggregations and individual digital resources are then *aggregated* into a new resource aggregation.

NOTE – The use of a separate accessibility conceptual model is required to record the judgment of support teachers about the accessibility properties of the resources. The use of such an accessibility conceptual model in resource aggregations could partially or even fully automate the described use case.

10. Use case 9

Widgets in a mashup personal-learning environment that use different specifications create, import, exchange, and make available to end users resource aggregations at runtime. For example, a widget using its own internal format might import resource aggregations that use IMS CP and METS and transfer the imported resource aggregations to an MPEG–21 based rendering widget.

10.1 Usage scenario

John is working in the sales department of a company. He is preparing himself for a meeting with an important customer. During preparation, he realizes that he needs information about different products in which the customer might be interested.

To close this knowledge gap, he logs into his personalized learning environment. His start page consists of a combination of several widgets, services, and portlets. These are, for example, widgets that include functions, such as content search, content rendering, content recommendation, calendar, and chat. John can select, add, and arrange widgets that support his personal learning needs.

One of the widgets on his personal start page gives John access to a course that is stored in the IMS–based company LMS. He also finds a widget that includes additional information related to the topic of the course from different resources. This information is being collected automatically from open content repositories, external wikis, and blogs.

Using a learning-path widget, he can view all relevant resources in an integrated learning experience. The learning process is supported by multiple tools, such as specialized content players, course management tools, and alerting services. Resources can be viewed from different angles by separate but cooperating tools.

Figure 9 illustrates this scenario.

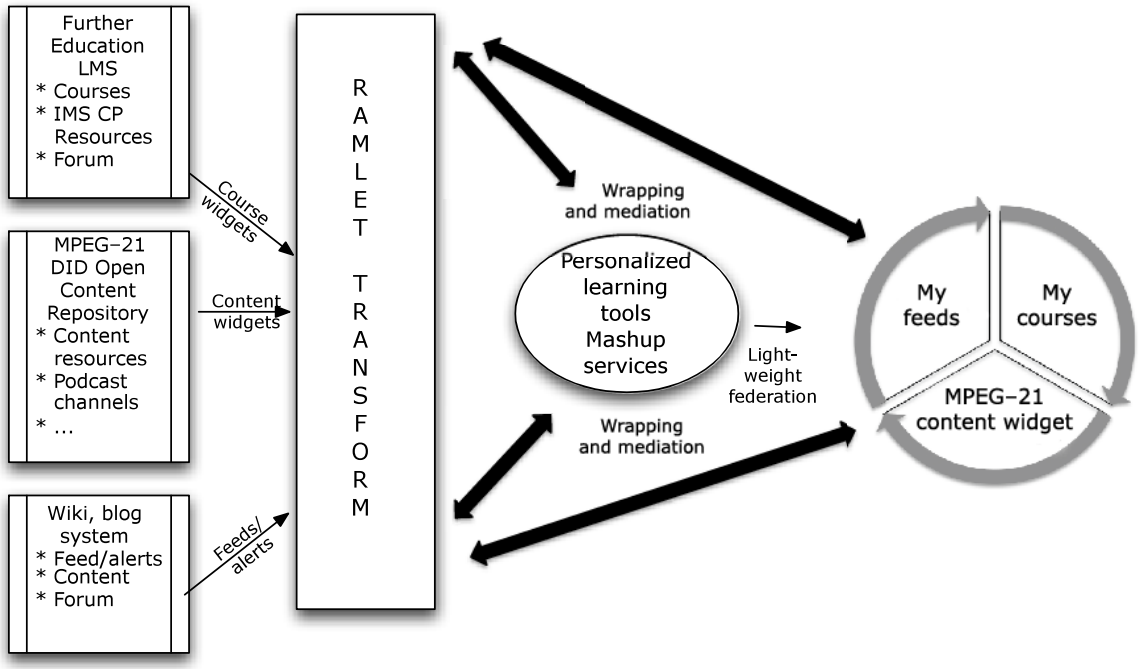

Figure 9 – Use case 9 usage scenario example