Use Case Description Template

<table>
<tr><td colspan="4" align="center"><h2>Use Case 0 - Definition</h2></td></tr>
<tr>
<td>Name:</td>
<td>Automated Information Extraction in Media Production Processes</td>
<td>Current Version:</td>
<td>2.1</td>
</tr>
<tr>
<td>Code:</td>
<td colspan="3">AIEMPro²</td>
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<tr>
<td>Summary:</td>
<td colspan="3">Automated information extraction techniques in modern media production processes will soon become an important process in file based production. This use case introduces such process and how it can benefit from integration in service based architectures</td>
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<td>Description:</td>
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Modern media production processes are characterised by an unprecedented high dynamicity in terms of delivery modalities, content types and workflow. Automation of processing and content-related information is considered a key in efficiently supporting this scenario. However, due to the diversity of software components in terms of integration paradigms, programming languages and originating domains, direct integration of content analysis components is not at hand. Leveraging a SOA approach is thus considered essential in order to contextualise the use of these tools in media production processes.

The basics of an automated information extraction process operation can be generalised as follows:

- *An multimedia content item stored into a media file, already ingested into the system or ingested contextually, has to be analysed and annotated by an automated metadata extraction component, e.g. faces appearing in the video content have to be detected and identified*

- *An automated metadata extraction component executes a set of pre-defined content analysis tasks on the multimedia content item stored in the container file. For example, it extracts key points from images in order to identify areas where a face is likely to be appearing*

- *The execution of the tasks by an automated metadata extraction component produces a set of metadata, which may be specified following one or more metadata schemas. For example, rectangles surrounding found faces are described using some MPEG-7 spatial descriptor which carries XY coordinates of the rectangles on the image plane*

- *The execution of an automated metadata extraction task on a multimedia content item is defined "task instance".*

- *The produced metadata may be subject to manual or automated verification and update, also depending on specific quality levels coming from the production process the metadata are supposed to support. For example false face detection are erased from the metadata.*

- *Verification data may eventually act as feedback information into the automated metadata extraction component, and used to trim and optimise internal parameters of its analysis processes. For example to discover that a threshold variation on the face detector may improve*

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	detection accuracy. *The above description applies either to individual multimedia content items or to content items which are part of a collection.* *However, in case of collections, some further operations can be included in the process:* - *tasks can be applied to entire collections without the need of specifying the application of the same task on each of the contained items in the collection* - *collections can be logically nested* - *there might be tasks executed by automated metadata extraction components specifically operating on collections, i.e. that generate collection-level metadata (e.g., genre-wise clustering of a collection)*
Initiating Actor:	*Archive Administrators, Production Staff, Automation*
Supporting Actors:	*Application Monitoring Staff, Annotators, Software Specialists, Databases, Task Schedulers*
Inputs:	*Content Flows* - *media files conforming to a pool of relevant standards (e.g., MXF) or whose format is de facto recognised by mostly used software decoders.* - *one or more XML documents describing collections* - *one or more XML files carrying configuration information and parameters*
	Information flows - *a reference to an multimedia content item stored in a media file already ingested in the system or to be ingested contextually* - *a description of or a reference to a collection of multimedia content items stored in a set of media files* - *a set of configuration parameters*
	Control flows - *Synchronous status monitoring at task instance level, including exceptions, management of retries, fallouts, termination of tasks and task model instances* - *Dynamic prioritisation of task instances* - *Statistics at various levels (e.g. tasks, collections), including support for basic online analytical processing* - *Basic access and browsing of produced metadata (e.g., HTTP*

	access to XML metadata documents being produced)
Outputs:	*Content Outputs* - *A set of XML documents conforming to relevant metadata standards (e.g, ISO/IEC MPEG-7 Audiovisual Description Profile, EBU Core)* - *A set of textual files containing detailed logs of each individual task execution*
	Information Outputs - *A (reference to) a set of metadata instances permanently associated to each processed multimedia content item or collection.* - *A (reference to) a (portion of) logging information where relevant*
Pre-conditions:	*Media files in which multimedia content items are stored must be accessible by the content analysis subsystem.*
Post-conditions:	*Absence of severe or unmanaged exceptions, actual execution of tasks, presence of output metadata instances, syntactic and semantic conformance of the metadata instances to the intended schemas.*
Non-functional requirements:	*Execution and memory/storage resource allocation should be pre-estimated and communicated in some form to the caller in advance. Estimated completion time should be provided. Execution-near-data at the individual task level should be ensured. Progress reporting and error notification should be supported by the service.*

Default flow:

1. *The process initiator select the multimedia content item I or collection C on which to perform a task instance execution by an automated metadata extraction component*

2. *The process initiator asks for the execution of a task instance t on the collection C or on the individual item I*

3. *The system estimates needed resources, and completion time for the execution of t and communicates these data to the process initiator.*

4. *If the initiator agrees on the provided estimation, the task instance is internally scheduled for activation*

5. *The automated metadata extraction component organises and executes internal data transfers needed to ensure execution-near-data*

6. *t gets activated, and the process initiator is notified of the activation*

7. *The initiator can optionally decide to postpone the actual start of execution or to manage prioritisation of the pool of activated task instances*

8. *t gets executed, and the process initiator is notified of the start of execution*

9. *The initiator can monitor the execution of t and browse the available metadata as soon as they are completed*

10. *when the execution is complete, the system notifies the initiator and communicates coordinates of the results. These may include information for downloading files from network repositories or data from databases.*

11. *the initiator accesses the results, optionally verifies and update their content and feeds back (implicitly or explicitly) the corrections to the automated metadata extraction component*

Exception Handling:

- *if resource estimation fails system-level predefined boundaries (e.g., maximum execution time, maximum allocated resources per task model instance), the initiator must be notified immediately*

- *if the initiator rejects the resource and completion time estimation, there should be a negotiation phase*

- *if part of the internal transfers for ensuring execution-near-data fail, the system should re-estimate execution times and notify these back to the initiator.*

- *If any task-level unmanaged exception occurs during the execution of the task instance, the initiator must be immediately notified. The initiator can decide to retry the task, or to terminate its execution*

- *If the results are not accessible, the initiator must be able to notify the event to the system*

Optional Actions:

None relevant at this phase

Questions:

It is an open question how to model manual and/or automatic validation.

Related Documentation:

[1] SMPTE 377M-2004 "Material Exchange Format"

[2] ISO / IEC Audiovisual Description Profile - http://mpeg.chiariglione.org/technologies/mpeg-7/mp07-avdp/index.htm

[3] EBU Tech 3293 - EBU Core Metadata Set

Use Case History:

Version	Date	Author(s)	Changes
2.1	20th December 2011	Alberto Messina (RAI) on behalf of TOSCA-MP project	

Figure 1: OASIS REFERENCE MODEL APPLIED TO FIMS