a.Univ.Prof. Dr. Herbert Prähofer
Institute for System Software

T +43 732 2468 4352
F +43 732 2468 4345
herbert.praehofer@jku.at

Secretary:
Birgit Kranzl
Ext 4341
birgit.kranzl@jku.at

Master's Thesis

Reactive Conversion Server

Student:	Sanel Badic
SKZ/Matr.Nr.:	0955543
Email:	sanelbadic@gmail.com
Advisor:	Dr. Herbert Prähofer
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Master-Thesis:

CELUM GmbH (http://www.celum.com) is a leading manufacturer of digital asset management systems. In the current project, a generic framework should be designed which should support the upload, analysis and the management of digital content.

The framework will be used for the definition of different tasks for digital files. Tasks can depend on each other and define, what should be done with a file and what the expected results are. Therefore, the model of the framework can be seen as a kind of „state machine" where each task is an own state with different steps as transitions. Moreover, a task should be asynchronously executable: it should be started as soon as the needed information has been received from it's predecessor (although this was not yet finished). The following use cases outline the use of the Framework:

- An analysis task could be defined, which is intended to collect basic metadata (file type, specific characteristics, ...) of an uploaded file. These metadata are then used by other tasks as input or for certain decisions (e.g. to delegate a file to a special server if specific characteristics are found in the file).
- An conversion task could automatically start the conversion of the uploaded file into different file-types based on the results of the analysis task. E.g., each new image/video upload should automatically trigger the creation of a new preview-image or other artifacts.
- A publishing task could listen on the results of the conversion task and, e.g., automatically publish a video on Youtube once the uploaded original video is available in a predefined type.

The aim of this project is the definition and implementation of a Reactive Conversion Server including

the following tasks:

- Analysis of existing solutions
- Definition of functional and non-functional requirements
- Definition of an architectural concept

Functional requirements (first draft):

- File uploads should trigger an automatic (background-) execution of tasks.
- Implementation of an own "Scheduler-logic":
  o The scheduler should be designed as a "State-Machine" as each file upload automatically triggers the execution of different tasks
  o The file type (image, video, etc.) defines which tasks must be executed and in which order.

- o New tasks should be freely definable by the user for each file type, e.g.:
    - Videos should automatically be published on Youtube after the conversion
    - Conversion of TIFF files into text searchable PDF files
  - o Each task depends on the result of its predecessor and should be executed once the needed data is available (even if the predecessor is still active).
  - o The server and users should be able to prioritize and stop tasks.
  - o It should be possible to, e.g., concurrently convert multiple uploaded files. These "Batch-Conversion" tasks should also be prioritizable, e.g. the server (and/or the user) should schedule conversion tasks at a later point if the utilization is currently too high on the server.
  - o The server should also automatically decide on which server a task execution should be done. The following input should be used for this decision:
    - Files' metadata
    - Utilization of the servers
    - Based on the artefacts of the file, e.g. if "watermarks" are found, different licenses are needed or even a 3D-Model needs to be converted, then the conversion-task should be delegated to a server which is able to handle these artefacts.
- The Conversion Server should be implemented as a Service. Therefore, an interface must be provided for the integration into different products/technologies.