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EAGLE- EnhAnced Government LEarning

Objective ICT-2013.8.2 Technology-enhanced learning;

c) Holistic learning solutions for managing, reaching and engaging learners in the public administrations

Small-scale Collaborative Project (STREP)
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Deliverable D6.10

EAGLE Argumentation Tool

WP6 - OER SERVICES – OER Public Administration Services
Lead Participant: LIST

Approval Panel	Name / Partner short name	Department / / Function	Date
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Software Title	EAGLE Argumentation Tool
Version	3
Release Date	2016-07-15
License	MPL-20.0
Languages	Go, HTML, Javascript

1 Introduction

The EAGLE Argumentation Tool provides a way for clerks in public administration to share their reasons and arguments for case decisions and to find similar ("most on point") cases about particular legal issues. The main service provided by the tool is to help clerks to decide "like cases alike", which is a basic principal of justice, for legal issues which are not well-defined by rules.

Reasons and arguments are represented and visualized in argument maps, using the Carneades argumentation system. To make it easy for clerks to enter and find argument graphs for cases about a particular issue, such as whether requiring an adult to support his or her parent would cause "undue hardship", a domain model is first specified for each such issue, using a simple JSON-based format, and uploaded to the EAGLE platform as an OER. Custom forms for entering and searching for cases, specific for each issue, are generated automatically from these domain models. Conceptually there is a separate case-base for each issue and each such case-base is an OER, with all the metadata properties common to all OERs, such as being able to be classified using the EAGLE process mapping tool.

2 Overview of the Prototype

The EAGLE Platform is a web application for sharing and finding Open Educational Resources (OERs). The William and Flora Hewlett Foundation defines OERs to be:

> teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, *software*, and any other tools, materials, or techniques used to support access to knowledge" (emphasis added)[1]

The EAGLE argumentation tool is software, more specifically a web application, and thus a resource of the kind that can be an Open Educational Resource.

The question remains how best to integrate web applications such as the EAGLE Argumentation Tool into the EAGLE platform. We considered two alternatives, at two different levels of granularity:

1. Each domain model of the EAGLE Argumentation Tool, for a particular legal issue, is a single OER. Metadata describing the domain model and including a URL linking to the domain model on the Web is registered manually with the EAGLE platform, where it can be indexed, categorized and searched in the same way as other OERs.

1https://en.wikipedia.org/wiki/Open_educational_resources

2. Each case entered into the casebase of the EAGLE Argumentation Tool is considered to be an OER. Using this approach, there would be many, possible thousands of OERs, resulting from the use of the Argumentation Tool. Using this approach, it should be possible to use the facilities of the EAGLE platform to index, categorize and search each and every such case. Moreover, the user interfaces for creating, describing, classifying and searching cases should be tightly integrated with the EAGLE platform and have the same look and feel as the rest of the platform.

After considering the pros and cons of both alternatives, it was decided to implement the first approach, where each domain model, but not every case, is an OER, because this level of granularity is comparable to the level of granularity of other OERs, where, for example, a textbook could be an OER, but not every page of the textbook.

3 The Argumentation Tool at a Glance

3.1 Problem(s) addressed by the Argumentation Tool

Clerks in public administration often need to decide “open” issues in cases for which there are no clear rules about how to implement the law. For example, family support law in Germany requires family members to support their direct ancestors (parents, grandparents, etc) and descendents (children, grandchildren, etc) if they are financial capable after taking care of their own needs and the relative is needy, **unless** doing so would cause “undue hardship”. The concept of “undue hardship” is not defined by any rules in the legislation. Nonetheless clerks are obligated to decide “like cases alike” and to justify their decisions in a clear way with reasons and arguments. And the basic fairness principle requiring like cases to be decided alike applies not only to the each clerk individually, but to all clerks in all responsible public agencies deciding this issue, collectively.

3.2 Solution proposed by the Argumentation Tool

The EAGLE Argumentation Tool helps clerks to decide open issues, issues for which there are insufficient rules, and to justify their decisions in a clear way with reasons and arguments, in such a way as to help ensure that like cases are decided alike, collectively for all clerks deciding such issues, across the boundaries of particular agencies.

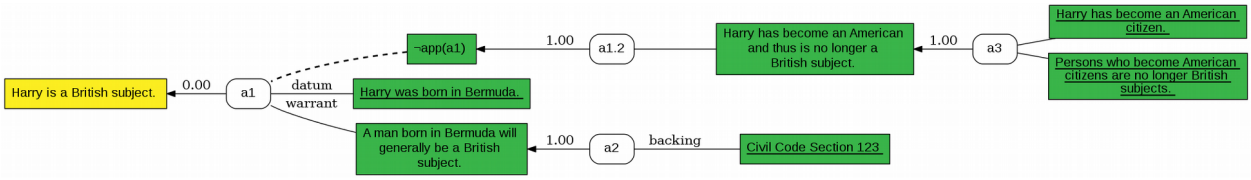
This is achieved by sharing a database of cases, called “casebases”, where each case in the casebase describes the facts of the case, the decision of the issue of the case and the reasons and arguments for and against the decision. The casebase is structured in such a way as to enable clerks to search for the cases, using factors and dimensions, which are most similar to the facts of some new case which has been yet to be decided. This enables the clerks to find and view the reasons and arguments, pro and con, for the decisions of the cases most similar to the one to be decided, so as to be able to make sure that the current case is decided fairly. Once a decision has been reached, the clerk can enter it into the casebase, along with the reasons and arguments pro and con the decision, to share it with other clerks and help them to decide further cases.

Essentially, the argumentation tool helps clerks to share their decisions and arguments, to enable them to learn from each other about how to decide open issues and collectively ensure that cases are fairly decided.

3.3 Innovative aspects of the Argumentation Tool

Document management solutions provide a way to share documents, including of course texts describing how cases with open issues have been decided and why. The argumentation tool goes beyond generic document management systems by using a structured model of the relevant factors to be considered when deciding open issues to enable a similarity metric to be defined, which can then be used to find and rank cases by similarity. Document management solutions provide a way to search for cases using full-text and/or metadata-based search, but are not able to find similar cases, or order cases by similarity.

Moreover, the argumentation tool provides a systematic way to explain the reasoning behind each case decision, using argument graphs. These argument graphs can be visualized in argument maps ("box and arrow diagrams") in such a way as to make it easier to quickly grasp and understand complex chains of reasoning. An example argument graph is shown below.



3.4 Prerequisites to use the Argumentation Tool

The argumentation tool is intended to be used by clerks who have received some formal legal training about how to decide cases with open issues, and how to justify these decisions with arguments and reasons. A few hours of training may be required to learn how to use the argumentation tool effectively. But no specialist computer expertise is required, other than basic computer literacy. In particular the clerks should know how to use a Web browser.

The argumentation tool is only useful to the extend that clerks responsible for deciding some open issue are willing to collaborate and help each other. Some organizational efforts will presumably be needed to inform clerks about the availability of the argumentation tool, to motivate them to make use of the tool, and to help them to get started.

The technical requirements for the clerks who are the end users of the system are a standard conforming Web browser (e.g., Chrome, Edge, Firefox or Safari) on a personal computer connected to the Internet. The argumentation tool runs as a service on the World-Wide Web and must be installed on a Web server. The server-side of the argumentation tool is an integral part of the EAGLE platform, installed with every EAGLE instance.

3.5 Integration of the Argumentation Tool into the EAGLE platform

For each open issue to be decided using the argumentation tool, a domain model defining the relevant dimensions and factors to take into consideration needs to be defined by a legal expert. The EAGLE portal front-end provides user interfaces for defining and uploading these domain models and for creating, modifying and deleting casebases. Each casebase is a learning resource on the EAGLE platform. EAGLE users will be able to find and access these casebases using the search facilities of the EAGLE platform, in the same way that other open learning resources can be found. Once the casebase has been found and

selected, a user interface is displayed providing the specialized search facilities of the argumentation tool, for searching for cases similar to the current case being worked on by the clerk.

4 The Argumentation Tool from a User Perspective

In EAGLE five personas have been developed as well as an overall scenario. This section first describes the user stories for the argumentation tool and then illustrates some of these user stories in an application scenario involving one of these personas.

4.1 User stories

User stories have been designed for the main components of the EAGLE platform to facilitate the technical review of the different software deliverables in WP5 and WP6.

All user stories have been defined in a standardised way to ease their understanding. Each user story defines a particular task to be performed by users in a particular role in order to achieve a particular value or benefit. User stories are provided below with unique name, in the scope of all EAGLE user stories, to enable them to be referenced by users during validation procedures.

The following template for user stories was used:

As <user role>, I want to <task to be performed>, so that <value or benefit achieved>.

The following user stories have been implemented in the third and final prototype of the EAGLE argumentation tool:

Argumentation Tool User Story 1 (ATUS1):

As a clerk, I want to be able to define and create casebases with custom domain models for issues on the EAGLE platform, describing the dimensions and factors of cases relevant to the particular issue, so as to enable custom forms to be generated for entering and finding cases for each type of issue.

Argumentation Tool User Story 2 (ATUS2):

As a clerk, I want to search and view the issues for which casebases are available on the EAGLE platform, so that I can know which casebases are available for entering cases and searching for cases.

Argumentation Tool Users Story 3 (ATUS3):

As a clerk, I want to be able to edit and update the domain models of the casebases I have created, so that I can correct mistakes in the models or revise the models to reflect my evolving understanding of the issues.

Argumentation Tool User Story 4 (ATUS4):

As a clerk, I want to be able to delete my own casebases from the EAGLE platform, to be able to clean up when the casebases are no longer useful or needed.

Argumentation Tool User Story 5 (ATUS5):

As a clerk, I want to be able to enter and upload cases using a selected casebase to share my decisions and reasoning about the issue of the casebase with other clerks, to make it easier for us to decide complex issues and justify the decisions of these issues in a way

which facilitates the deciding of "like cases alike".

Argumentation Tool Users Story 6 (ATUS6):

As a clerk, I want to be able to view the metadata, description, factors, and decision of cases which have been entered into a casebase, to help me to compare precedent cases with the case I am working on and trying to decide correctly and fairly.

Argumentation Tool User Story 7 (ATUS7):

As a clerk, I want to be able to edit and update cases which I have entered into a casebase, so as to be able to correct any mistakes or otherwise improve the quality and usefulness of my cases for other clerks.

Argumentation Tool User Story 8 (ATUS8):

As a clerk, I want to be able to delete cases I have entered into a casebase, if for any reason I believe the case is no longer useful for helping my colleagues to decide other cases about the issue of the casebase.

Argumentation Tool User Story 9 (ATUS9):

As a clerk, I want to be able to search a casebase to find cases which are most similar ("on-point") to the one I am trying to decide, to help me to perform "case-based reasoning", focus on the most relevant precedents on both sides of the issue and to decide like cases alike.

Argumentation Tool User Story 10 (ATUS10):

As a clerk, I want to be able to visualize the reasoning behind the decision of a case in two-dimensional diagrams (called "argument maps"), to help me to better understand the arguments behind the decisions of precedent cases and be better able to adapt these arguments to the case I am currently working on and trying to decide correctly and fairly.

4.2 Argumentation Tool Application Scenario

This application scenario involves the persona of Seamus.

Seamus is responsible for processing family support claims in his town. In particular, when an elderly person needs support and applies for social benefits, Seamus has the responsibility of looking for adult children and grandchildren of the elderly person and determining whether any of these relatives may be legally obligated to support the elderly person and thus also to compensate the town for any support expenses it may have incurred. In general, in Seamus' country persons are legally responsible for supporting all relatives in "direct lineage". This includes not only their own children, but also their grandchildren, parents and grandparents. This is the general rule. However there are exceptions. One such exception is "undue hardship". A person is not obligated to support the relative if this would cause him or her undue hardship. The concept of undue hardship is not defined by rules, but over the years a number of factors have been identified which must be taken into consideration when deciding whether a case of undue hardship exists. For example, whether the relative being asked to provide support had been abused the elderly person as a child. In order to help him and his colleagues to decide undue hardship issues,

in a way which helps to assure that like cases are decided alike, Seamus decided to make use of the EAGLE Argumentation Tool, which is provided by his town and is connected with the EAGLE platforms of other towns in his region. After using the search functions to confirm that no one else has yet set up a casebase for undue hardship issues on the EAGLE platform (ATUS2), Seamus defined a domain model for the issue of undue hardship, using a text editor and following the instructions in the Argumentation Tool user manual, and then used the portal front-end to create a casebase OER for the issue and upload the text file of the domain model (ATUS1). Over the course of the next few months, Seamus entered the facts and decisions of his own undue hardships cases into the casebase (ATUS5) and used the casebase to find his own most similiar prior cases (ATUS9) and view their descriptions and reasoning (ATUS6, ATUS10), to help him to decide his new cases in a way which respects the principal of deciding like cases alike. Seamus used the social features of the EAGLE platform to announce the availability of his undue hardship casebase to collegues responsible for deciding such issues in his own and other towns. Seamus was pleased when some of these colleagues began to make use of the casebase to help them decide their own cases (ATUS9, ATUS6, ATUS10), especially when they began to enter their own cases (ATUS5). Finally, Seamus, being visually impaired, appreciated the accessibility of the EAGLE Argumentation Tool and its compliance with World-Wide-Web Consortium (W3C) accessiblity standards for Web applications.

5 System Architecture

The EAGLE Argumentation Tool is a web application with a three-tiered architecture consisting of:

- A document database, for storing cases and arguments, serialized in JSON and implemented using Apache Couchdb.
- An application logic layer, running on the server-side and implemented in Go. This layer links to the Carneades Argumentation System as a library.
- A web client and user interface, implemented in HTML and JavaScript using jQuery Mobile

The following figure shows how the argumentation tool is integrated into the overall EAGLE platform.

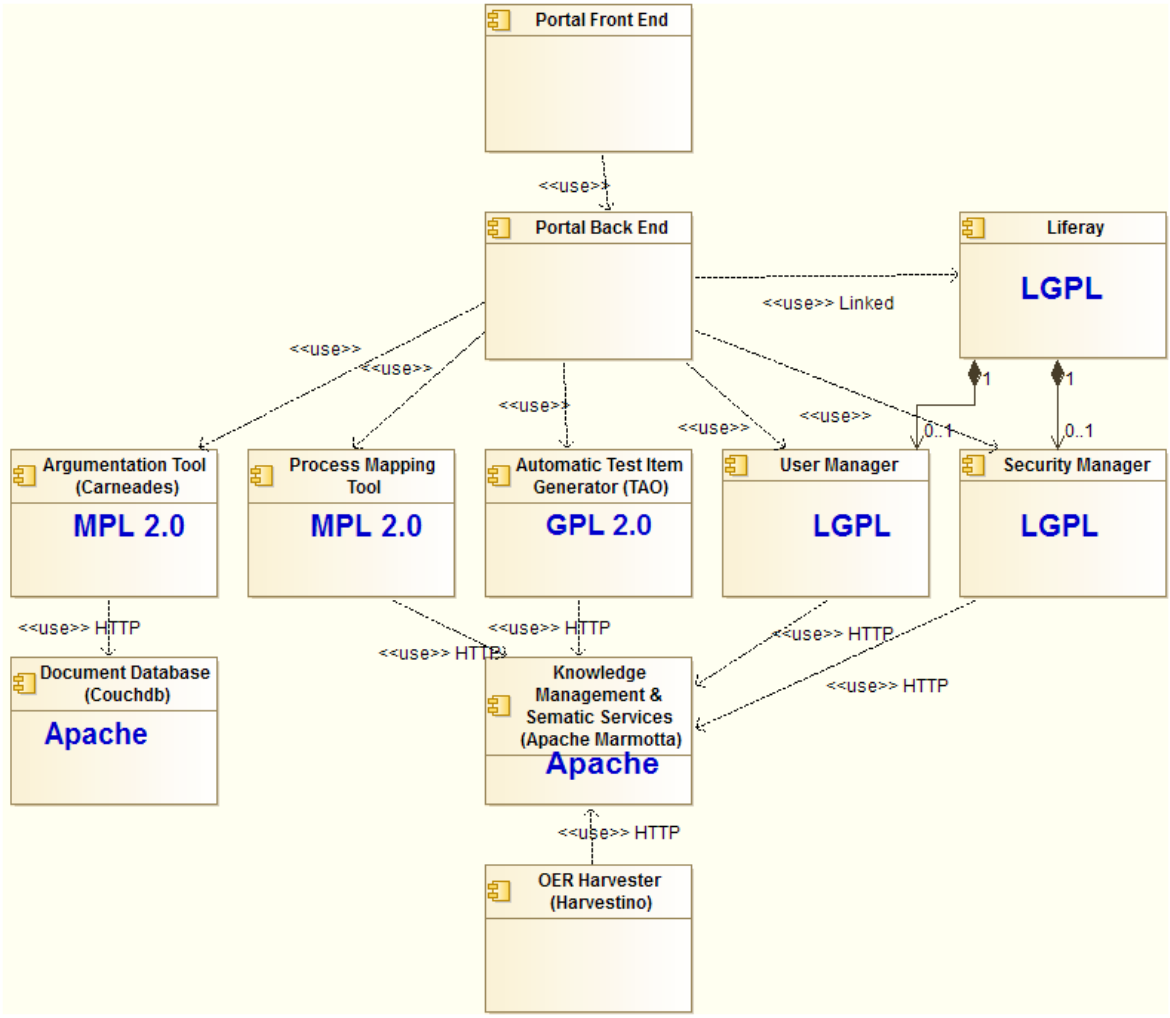


FIGURE 1: A TOP-LEVEL VIEW OF THE EAGLE PLATFORM

6 Accessibility

The accessibility guidelines for the EAGLE platform specified in D4.3 (Learning technologies – contextual analysis), which recommends following the W3C Web Content Accessibility Guidelines (WCAG), have been adhered to in the design and implementation of the EAGLE Argumentation Tool. Most of the user interfaces of the Argumentation Tool have been implemented using the jQuery Mobile JavaScript library for responsive, display independent user interfaces, which adheres to the W3C Accessible Rich Internet Applications (WAI-ARIA) guidelines, which are part of the same W3G Web Accessibility Initiative (WAI) as the earlier WCAG guidelines:

> jQuery Mobile is built upon standard, semantic HTML, allowing pages to be accessible to the broadest range of devices possible. For A-Grade browsers, many of the components in jQuery Mobile leverage techniques such as focus management, keyboard navigation, and HTML attributes specified in the W3C's WAI-ARIA specification. By utilizing these techniques, we do our best to ensure an accessible experience to users with disabilities such as blindness, who may use screen readers (like VoiceOver, on Apple's iPhone device) or other assistive technology to access the web.

The remaining user interfaces of the Argumentation Tool, for creating, reading, updating and deleting casebases, are tightly integrated with the rest of the EAGLE Platform, and have been developed using the same tools and following the same accessibility guidelines as the rest of the EAGLE portal front-end.

7 Source Code of the Current Release

The EAGLE Argumentation Tool is open source software published using the Mozilla Public License, Version 2.0 (MPL-2.0). The source code of the EAGLE Argumentation Tool will be publically available on Github before the end of the EAGLE project. (Currently the source code is in a private repository.) You should be able to find the repository by searching Github. Please contact the authors if you need help finding the public repository.

8 Installation Guide

These are instructions for building and running the EAGLE Argumentation Tool.

8.1 Test Server

The final prototype of the EAGLE Argumentation Tool is integrated into the EAGLE platform and can be tested and evaluated, without having to install any software, online, using the test installation of the EAGLE platform at https://eagle-irl.dhbw-heidenheim.de/

8.2 Prerequisites

The following software is required for building, installing and running the EAGLE Argumentation Tool:

- Version 1.6x or newer of the Go programming language compiler suite.
- A Git client.
- Write access to an installation of the CouchDB Document Database.

8.3 Configuration

Set the `GOPATH` environment variable to a directory for Go packages, e.g.

```
$ mkdir ~/go
$ typeset -x GOPATH=~/go
```

8.4 Building and Running the Tool

Search for the source code respository of the EAGLE argumentation tool on Github. Let `<repository>` be the name of the repository. Use the `go` tool to get, build and install the Argumentation Tool executable:

```
$ go get github.com/<repository>/internal/cmd/eagle-argumentation-tool
```

Be sure to replace `<repository>` with the name of the actual respository in the above command.

The `eagle-argumentation-tool` executable should now be installed in

```
$GOPATH/bin/eagle-argumentation-tool
```

You can execute the program using this full path. Alternatively, add `$GOPATH/bin` to your PATH environment. You should then be able to execute the command directly, as in

```
$ eagle-argumentation-tool
```

9 Conclusion

This completes this summary description of Deliverable D6.10 of the EAGLE project, a software prototype of the EAGLE Argumentation Tool. The Argumentation Tool provides a way for clerks in public administration to share their reasons and arguments for case decisions and to find similar ("most on point") cases about particular legal issues. The main service provided by the tool is to help clerks to decide "like cases alike", which is a basic principal of justice, for legal issues which are not well-defined by rules. Reasons and arguments are represented and visualized in argument maps, using the Carneades argumentation system. To make it easy for clerks to enter and find argument graphs for cases about a particular issue, such as whether requiring an adult to support his or her parent would cause "undue hardship", a domain model is first specified for each such issue, using a simple JSON-based format, and uploaded to the EAGLE platform as an OER. Custom forms for entering and searching for cases, specific for each issue, are generated automatically from these domain models. Conceptually there is a separate case-base for each issue and each such case-base is an OER, with all the metadata properties common to all OERs, such as being able to be classified using the EAGLE process mapping tool.

This is the final version of the Argumentation Tool to be developed within the EAGLE project. Future development of the Argumenation Tool will depend upon the success of the EAGLE exploitation plan, after the completion of the project.

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