Integration with TENCompetence Project

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MACE

Integration with TENCompetence Project

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Author(s) OUNL, with contributions from partners

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TENCompetence and MACE - why integrate?

TENCompetence\(^2\) is a European Integrated Project set up with the target to integrate a different levels and approaches of learning content tools, learning activity tools, competence development programs, and learning networks in a common open source infrastructure to enable and foster lifelong competence development and learning. The main objectives are

- to research and develop innovative methods and technologies for the creation, storage, use and exchange of knowledge resources related to lifelong competence development,

- to research and develop innovative, standards-based methods and tools for the creation, storage, use and exchange of formal and informal learning activities and units of learning. This includes tools for the assessment of the learning process and learning outcomes,

- to research and develop innovative methods and technologies for the creation, storage, use and exchange of formal and informal competence development programs (including the assessment of previously required competence levels, navigation support, and the sharing of successful formal and informal learning tracks), and

- to research and develop models, methods and technologies for the creation, storage, use and exchange of networks of competence development programs from different sources around Europe to support lifelong competence development.

While TENCompetence targets a shift in the educational paradigm towards competence-based education, MACE can be seen as coming from another perspective towards making use of educational contents also but not mainly in competence driven educational approaches. Nevertheless, considering the different levels necessary to achieve an integrated support several aspects are relevant for integrating technical and strategic solutions of TENCompetence and MACE, including:

- knowledge resources used in learning networks need to be created, stored, used and exchanged driven by metadata or based on distributed learning content repositories. This basic problem of making resources available is solved for a specific domain in the MACE project,

\(^2\) TENCompetence Integrated Project is funded by the European Commission (IST-2004-027087) (www.tencompetence.org)
- learning activities that are created and shared in Learning Networks need content and learning objects. A typical example of this is the authoring of Units of Learning, where search on content repositories and the dynamic integration of learning objects is essential.

- Competence development programs make use of contents on the one hand but also integrate competences, and competence maps defined in a domain or learning network. The link between competences, competence profiles (or maps) and the knowledge resources and Unit of Learning is relevant for TENCompetence while MACE mainly focuses on the link between knowledge resources (or learning objects) and the competences associated with it in WP5 on competence metadata. First cycle pilots in the TENCompetence project have shown that the use of competences for structuring access to learning resources is highly efficient for supporting self-regulated competence development, and

- Learning networks are the high level element of TENCompetence and the integration of formal and informal learning support is essential in learning networks and furthermore understanding the dynamics and incentive mechanisms behind learning networks is essential for building such networks and how they make use and integrate educational contents.

Figure 1 gives an overview of the different levels of integration and their interrelationships from knowledge resources to learning networks. The underlying data model is currently implemented in the TENCompetence Rich Client in which following relations between the main entities of competences, competence profiles, learning activities, and knowledge resources are implemented. Figure 2 is taken from the Personal Competence Manager User guide.
Knowledge Resources

Knowledge resources are basically the containers that store the explicit knowledge for sharing purposes. Examples are learning objects, articles, books, software programs, informal messages, etc. On the level of knowledge resources TENCompetence will integrate with other initiatives in the knowledge resource sharing & management area to circumvent cold-start problems, using open standards (Advanced Distributed Learning, 2004; IMS Global Learning Consortium, 2004a) and protocols for federated search and access (GLOBE, 2005; Prolearn, 2005). The project develops models and methods to stimulate and organize pro-active creation, storage, search, retrieval, packaging and quality rating of knowledge resources. Beside current ongoing efforts to manage and share knowledge resources (Littlejohn, 2005) the project especially also looks at the social aspects in the sense of social exchange theory and to use a set of rating and recommending mechanisms allowing users of knowledge resources to feedback information on their quality into the competence development network.
Recent research in technology-enhanced learning has been dominated by learning objects, and the shrink-wrapping of content for delivery in different contexts is becoming mainstream e-learning practice. A counter approach builds pedagogical processes on top of the learning & knowledge objects. This new, learning activities based approach does not oppose the learning objects approach, but integrates it with a higher-level layer.

Currently the developments in WP5 of TENCompetence are working on support for knowledge sharing scenario through resources' collection and use:

- identify and select core/additional functionalities for supporting knowledge sharing activities
- define the specific activities to support in a knowledge sharing scenario
- design the interaction models for an aggregation web tool
- develop a web tool supporting core/additional functionalities for knowledge sharing in communities

A list of services is released at the end of May as the delivery of this deliverable unfortunately overlaps with the delivery of the TENCompetence web services. Online documentation for all services is available and for the TENCompetence General Assembly from 2 June – 7 June in
Salzburg first meetings between the MACE project and TENCompetence Teams are scheduled. (TENCompetence Software at DSPACE³, 2008)

Knowledge resources are the core integration point between TENCompetence and MACE. Based on a scenario approach in TENCompetence workpackage several functional requirements have been inferred, an overview is given in figure 3. These requirements are comparable and related to functional requirements detected in the pedagogical MACE scenarios.

![Figure 3 - Scenarios and functional requirements for working with knowledge resources](http://dspace.ou.nl/handle/1820/500//browse-date)

**Learning Activities and Units of Learning**

Learning activities are the designed or performed activities of a person that are directed at the attainment of a (explicit or implicit) learning objective. Designed learning activities are called
'units of learning' (UoLs), such as courses, workshops, lessons, etc. A unit of learning adds a 'learning design' to the knowledge resources; they add pedagogical aids like study tasks, tutoring, mentoring, monitoring communication services, feedback, formative and summative assessments. TENCompetence work in this area is integrating and extending several existing initiatives around Europe to ensure that the benefits of the Learning Activities approach are apparent and its adoption is eased. Fundamentally, the project will ensure that the focus of technology enhanced learning falls upon innovative approaches to competence development (e.g. learning in communities) rather than underlying technological infrastructure (Koper & Tattersall, 2005).

TENCompetence delivers tools and support for collecting and integrating knowledge resources from federated resources and identifiable with unique identifiers (for example via webservice using URIs) in a variety of pedagogical scenarios. Units of Learning combine learning activities in which authors and learners in the PCM can make use of learning resources and combine them with activities.

In MACE, the question of adding learning designs to knowledge resources was approached by analyzing relevant learning and teaching activities in architecture and design education (see Joint Deliverables from work packages 3-6). Nevertheless MACE does not deliver integrated learning and teaching tools to implement support for those learning scenarios in distance education or classroom/design studio practice. This could be done by using the TENCompetence open source tools as Personal Competence Manager (PCM).

**Competence Development Programs**

In the Personal Competence Manager (PCM) competence development plans are defined by learners and authors and can be shared amongst participants in a learning network. Figure 4 shows the PCM Competence development plan module:
Competence development programs crucially depend on a number of services and components. Firstly the competence records of learners cannot be treated as clean slates, as they possess prior competencies at certain levels, this requires a positioning service. Secondly, the learner’s personal competence development plan needs to be translated into program-bound learning activities, identifying those which are relevant to the plan and those which are not (learning path service). It is likely that several routes lead to the competence development goal as specified in the personal development plan.

Personalized recommendations in the research on adaptive hypermedia systems is often based on individual user models but more and more social navigation support mechanisms become prominent and commercially successful. Fourth, while carrying out a learning activity, the learner is likely to need human help at some point of time; in this case a learner support service will find related peers and tutors. Finally, a learner who has acted upon the
recommendations of the allotment and navigation services, who with the help of tutor or peer support has achieved the goals specified in his or her personal development plan, in the end will want to know at what level of competence he or she performs. A performance assessment service (posterior assessment) should spring into action to accomplish this and closes the cycle to a new turn around to the next competence target profile.

Competence Development Programs are formal or informal collections of learning activities and units of learning that are used to build competence in a certain discipline or job. Depending on the competencies to be built, these programs can be small or quite extensive (e.g. a masters program). In addition to formal programs offered by institutions, it is also possible to store and share learning routes and paths that are the results of exploratory behavior and exchange them among the users.

A reusable competence definition captures "the part of competence information that may be reused for more than one person in one or more contexts and possibly with different metrics" into simple and existing standard formats such as IEEE RCD (IEEE, 2004), IMS RDCEO (IMS Global Learning Consortium, 2004d), or HR-XML (HR-XML Consortium, 2006). This “context neutral” information can be published in public competence registers. This is the same approach taken in MACE with the competence catalogue services that allow a central registration and definition of competences in a domain and providing services for the integration in enrichment activities and browsing for exploration of data sets but also for the integration into learning environments.

To describe a learner’s existing competence repertoire (accredited on non-accredited) a common language needs to be used. This language should help, for any specific competence, to establish at what level a learner possesses the competence in question, whether a learner strives to acquire it, and whether a particular competence program caters for its acquisition. Both in TENCompetence and in MACE the European Qualification Framework is chosen as the basis for the definition of competences and the competence definitions can also be exchanged with HR-XML and IMS RDCEO compliant services and repositories.

Research needs to be done into the questions of how semantic web tools may be used. Last but not least, the competencies that a user has to acquire for different jobs and tasks change all the time. It is essential that these competencies are monitored in the field and that a mapping mechanism is available to map older definitions of competences to the changed new ones.
Learning Networks

Networks for Lifelong Competence Development are defined as collections of programs. Networks can be defined within a single country or institute (e.g. all the programs offered by a university or training company) or across countries and institutes. Networks are however defined in one (larger) domain of knowledge like economy, digital media, management, music, etc. In this activity TENCompetence develops tools to support the interoperability of formal and informal competence development programs from different providers, and from different countries.

Service Overview of TENCompetence and MACE

TENCompetence and MACE both provide services for different tasks and goals and the combination of those services is possible in different ways. First we want to give a high level overview of the available services in TENCompetence and MACE and then discuss how the integration is possible in different forms of end user clients and interfaces.

The TENCompetence deliverable 3.6 gives all details of all available services in the current version of the PCM the descriptions for an overview and the relation to MACE services see also figure 5.
Figure 5 - An overview of services from TENCompetence (orange) and MACE (blue)
Integration Strategies of TENCompetence and MACE

As a basic integration strategy different options are currently discussed in the TENCompetence consortium. TENCompetence provides currently a rich client based on the Eclipse Rich Client interface. This enables the development of plugins that can simply be combined with existing client components in the rich client interface. A second option is the web-based integration where an approach via a widget server and different web-based widget is discussed as also in the MACE project.

**Widget Level Integration**

Based on the description in Joint Deliverable 5 section “The widget concept”, external and MACE service components will be integrated via a widget approach, which allows for flexible combination of different functionalities while still is able to synchronize the display for the end user. The widget paradigm has been made popular in several domains over the last years – as various mini-applications on a user’s desktop, for instance, displaying items of a news feed, or current weather conditions. And more and more online services provide HTML snippets to embed functional components into other web pages.

These widgets, will be compact, specialised applications or application components and can not only be combined to build more complex applications, but also be integrated into existing portals and learning management solutions on their own so this is also enabling the integration of MACE widgets in the upcoming TENCompetence widget based web interface.

In the TENCompetence project a first version of a widget server has been developed which allows the web-based integration of different widgets based on the latest W3C Widget working draft. Recently the W3C has released a Widgets v1.0 working draft documents. The specification is targeting platforms such as Apple Dashboard, Microsoft Sidebar, Yahoo! Konfabulator, and mobile platforms such as WidSets. Web widgets, such as Google Gadgets, are not currently in scope, although when digging into the details of the specification, it is obvious that web widgets can potentially be developed in a similar manner. The current scope of the W3C work is set out in the Requirements document. W3C defines widgets simply as:

“small client-side Web applications for displaying and updating remote data, that are packaged in a way to allow a single download and installation on a client machine,
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mobile phone, or mobile Internet device. Typical examples of widgets include clocks, CPU gauges, sticky notes, battery-life indicators, games, and those that make use of Web services, like weather forecasters, news readers, email checkers, photo albums and currency converters."

A surprising omission at this stage is the API specification. All widget container platforms supply an API, typically accessed via JavaScript that offers the widget a way of storing and retrieving preferences, calling remote services, and executing various kinds of commands. Presumably this will be released next; currently there is only an Editor's Draft of "APIs and Events". Currently a developer of a Widget needs to make different API calls based on where the Widget is deployed to do very basic things like save and retrieve user settings (from Scott, 2008, http://zope.cetis.ac.uk/members/scott/).

Another aspect of a widget API is extended features, especially in the case of web widgets. The Google OpenSocial API is an example of an extended widget API - in this case to enable widgets to access things like friend’s lists and status information. Another is the widget collaboration API we developed here as part of our EU TENCompetence project, that enable things like activity-based chat and voting widgets to be developed using the draft W3C specification. TENCompetence has developed a widget server platform which allows the implementation of Learning Designs combined with a widget engine that enables the deployment of LD with widgets for supporting different learning activities.

The latest developments of the related W3C group can be found at http://www.w3.org/2006/appformats/ and both projects are planning for the future to cooperate on a shared widget platform and integration mechanism.

**Available MACE Widgets**

For different metadata types or functionality, a dedicated widget can be used to visualize metadata values, edit metadata, filter searches and navigate contents. Different MACE widget types can be distinguished:

- Basic widgets handle basic user management and navigation tasks. Examples are a login widget, a simple search box (triggering a search on the MACE portal) or a link
- Content presentation widgets can be used to display content collections from the
- Repository widgets, such as related pictures for a given article, a list of search results or a single content item.

- Metadata widgets visualise metadata values and aggregations of metadata values (so-called metadata profiles). Additionally, they allow editing of metadata as well as meta-data based navigation, search and filtering.

The MACE approach relies on a multitude of available metadata. Whilst some of it is generate automatically, experts and other users contribute meaningful information as well. For this reason, MACE widgets are additionally used to edit metadata. Where applicable, direct manipulation interfaces will enable visual, interactive access and manipulation, instead of tedious and error-prone form filling.

**The TENCompetence Widget Server**

In the TENCompetence project a widget server has been developed which allows for the integration of widgets and a control of them based IMS Learning Design. Basic documentation can be found at [http://www.tencompetence.org/ldruntime/widgetserver/](http://www.tencompetence.org/ldruntime/widgetserver/).

The widgetserver mainly enables Learning Design authors who wish to use actual services within SleD/Coppercore environment and allows authors to leverage & create new external services and use them in their Learning Designs. The server is based on the draft W3C widget specification it offers the possibility to add new widget services and make them available to the Learning Design runtime. The service is external to the Coppercore engine and is implemented using the Coppercore Service Integration framework.

An example for using the widget server to integrate and control a simple chat widget based on a Learning Design can be seen in figure 6.
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Figure 6 - The Chat widget integrated in the TENCompetence widget server based on CCR and SLED
Conclusion

The integration between projects has been started in an early stage on a loose level in the sense that compatible competence models have been introduced and integrated in the core architecture of each project. Furthermore the projects have concentrated on the main focus and developing technical services following the identified user scenarios and use cases. At the current state both project are rolling out new versions of a web-based portal (MACE) and a rich client and a web-based client (TENCompetence). Both frameworks are flexible and can integrate and combine services of the other project. In that sense future work for the integration will target orchestration and evaluation of service combinations in end user scenarios. TENCompetence is already evaluating the tools and technologies in pilots. Plannings for the evaluations in MACE will also include the usage of the TENCompetence services and tools for educational scenarios.
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References


