SYNTHESIS-CORE:[1] A system for managing, documenting and promoting cultural assets, entities and processes

SYNTHESIS-CORE is an information system for the scientific and administrative documentation of Cultural resources and the activities and processes that create them. SYNTHESIS-CORE supports a generic and flexible documentation model and provides a web user interface environment specifically adapted for the description of knowledge concerning cultural entities (material or immaterial) and processes (scientific and administrative, alike), such as: collections of material objects and audiovisual material of cultural interest; museum objects; works of Art; monuments; archaeological sites; scientific equipment, tools and work. It also allows different kinds of access to the system e.g. managerial, scientific, etc. It is multilingual and supports data exchange in the form of XML/RDF files, as well as presentations over the Internet. The use of XML/RDF for data exchange ensures the validity, sustainability and interoperability of the data.

The context of the scientific and administrative documentation

The scientific documentation involves recording and curating data regarding cultural objects, such as information about their creation (who, when, where and how these objects were created, , their morphological, typological and stylistic features), their use and discovery; additional information concerning the objects' association with known personalities at the time of their creation and/or use, as well as the kind of the association, is also recorded; as are the technical features of the documents/audiovisual material (file type, format, size).
The scientific documentation supported by the system is CIDOC CRM ISO21127 compliant.
The administrative documentation includes cultural data pertinent to the administrative procedures that take place in the context of cultural organizations/managing bodies, such as ownership, rights to use, reproduce and disseminate cultural information , exhibitions, loaning and moving of cultural objects, etc. SYNTHESIS-CORE follows the SPECTRUM: The UK Museum Documentation Standard to document these procedures.

General system characteristics

The system utilizes multilayered architecture, open-source software, national and international standards and XML & RDF technologies to provide significant capabilities in relation to:

Data organization

Information concerning the objects/documents is organized in structured files and directories that:

- ✓ provide flexibility in relation to their structure
- ✓ allow the conceptual structuring of the information
- ✓ can differentiate the data structures, according the type of the cultural documents

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[1] In reference to version 4.0

    ✓   support the creation of multiple translation documents from the existing documents in many languages

    ✓   allow the dynamic dissemination of the information in websites

    ✓   support semantic and syntactic interoperability

The conceptual modelling of data is compliant with CIDOC CRM ISO 21127 and the standard recommendations of the Operational Programme "Information Society" as reflected in the "Guidelines for Cultural Documentation and Interoperability".

The system supports management of records documenting entities such as the following:

- ✓ Cultural objects (mobile and immobile objects, material and immaterial things)
- ✓ Collections of cultural objects
- ✓ Digital or analog image files (photographs, sketches, designs etc)
- ✓ Audio files (radio broadcasts, podcasts, etc.)
- ✓ Multimedia files (video recordings of events, public speeches, concerts; documentaries, advertising and promotional material, etc.)
- ✓ Scientific equipment and tools
- ✓ Scientific research/ processes
- ✓ Administrative processes (acquiring and granting rights to use; uses, loaning, moving and assessing an object, etc.)

- ✓ References (publications)
- ✓ Records
- ✓ Collections
- ✓ Exhibitions
- ✓ Testimonies
- ✓ People
- ✓ Organizations
- ✓ Departments
- ✓ Locations
- ✓ Materials
- ✓ Events

Users can create new records to document new entities, as well as update and extend existing files.

Synthesis-CORE: System functionalities

The system supports the following functionalities:

- ✓ **Creating and managing documents**: create, view, edit, translate, copy and delete a document, assign a document to a user/editor, request to publish an "unpublished" document, publish an "unpublished" document, reject the request to publish an "unpublished" document, retract a published document, etc.

- ✓ **Creating versions for a document:** create a new version for a document (for a particular conceptual entity supported by the system), view all available versions (for a specific document).

- ✓ **Navigation and searching:** the user can search documents for the conceptual entities supported by the system. By typing a word in the "search" field the system will display all (and only) the documents that contain this word. The editor can also group the results by performing a search based on the status of the documents (published, to be published, etc). The system also provides an advanced search, which allows users to define the search criteria.

- ✓ **Interconnectivity and data exchange:** that includes exporting documents (single or multiple) in XML/RDF, exporting document templates, importing documents; furthermore, the system supports the use of thesauri, ontologies, and allows exporting data based on mappings.

- ✓ **Documenting records in more than one languages**: the current default languages are English and Greek. =The system can be expanded to support more languages.

- ✓ **Documentation associations:** the system supports multiple associations among documents

- ✓ **Administrative functionalities:** terminology management, backup & restore.

It also comprises of the following sub-systems:

✓ **FeXML editor**: supports the functionality of editing XML documents. It allows users to Show/Hide fields in the XML document, rename field labels, display the XML document map, etc.

✓ **Reports component:** supports a process for creating and using report templates to create customized reports of the data stored in the system in various formats, such as .pdf, .docx, etc.

✓ **GIS component:** supports displaying and searching of information on a map and/or on various cartographic backgrounds.

✓ **Media Viewer component**: supports displaying different kinds of documents (image, text, audio, video) in a uniform way; additional functionalities involve: zoom in/out, download, etc.

✓ **Cloud component:** supports cloud services, including private cloud services –based on the open-source software nextCloud.

✓ **Statistical analysis for quality check and content curation component:** supports collecting statistical data in order to perform quality checks and to oversee the curation of the content of the XML documents.

Regarding file management, SYNTHESIS-CORE supports storing different kinds of files (image, text, audio, video, etc.) using internal storage or cloud services.

Furthermore, it offers enhanced levels of security and confidentiality of information. This is achieved through the use of secure online connections (https protocol), user authorization/authentication mechanisms, and data encryption. Last, the system is GDPR compliant.

User types

SYNTHESIS-CORE supports a security system distinguishing among user-groups, each type granted different rights to perform certain actions in the system. The system distinguishes among the following user types:

- System administrator: performs managerial activities, such as backup control, creating Organizations, etc.
- Organization/Department administrator: performs activities relevant for a particular organization, such as managing users, assigning documents to editors, publishing documents, etc.
- Editor: performs basic documentation activities that are relevant for a given organization
- Guest: can only view documents that are specifically marked as available for viewing

Authenticating users in the system is based on the open-source software, Keycloak, which allows a single sign-on user authentication. Single sign-on is an authentication scheme that allows users to use one unique identifier, to log into several independent, yet interconnected, software systems.

Documentation workflow model supported by the system

SYNTHESIS-CORE supports specific workflows that can be amended according to the requirements set by an Organization/Institution.

An example of the workflow can be found below:

A specific user tasked with overseeing the documentation within a particular organization, or someone with similar responsibilities, (user role: administrator) creates documents for the cultural objects. These documents are subsequently assigned to editorial teams or individual editors (user role: editor), who, in turn, collect, manage and store information about the specific objects. When information processing is complete, the members of the editorial

team (editors) "flag" the document in order to be published (the document is flagged as "request for publication". The document is "locked" and is no longer available for editing). The administrator can then publish the document or return it to the editors for further reviewing and revision (In the latter case the document is flagged as "not published" and it can be accompanied by a brief note explaining the reason for the rejection). The editors can further edit it and then place a new request for publication. If, for some reason, an already published document needs to be modified, the editor can ask the administrator to retract it. The document is then returned to the editors who can further revise it and then put a new request for publication.

Each editor can view and work on the object documents for which they have editing rights. They can also view (but not edit) documents that belong to other users of the same organization. Published documents can be viewed by all users of the organization / federation but nobody can edit them.

The information entered in the documents is conceptually structured and allows editors to choose the sections they wish to document.

System architecture

SYNTHESIS-CORE uses the 3-tier architecture model. This allows for the separation of the application logic (that processes the data), from the manner and the means of presentation. This feature ensures open architecture, expandability, adaptability and flexibility. The three major independent modules consist of the database, the functional components and the user interface; for a graphic representation, see diagram below:

Data (i.e., records of documented entities) are stored in a central database and users (curators, administrators) can access them through the internet (by means of multiple simultaneous connections), in order to use the system's functional components according to the type of access rights they are given.
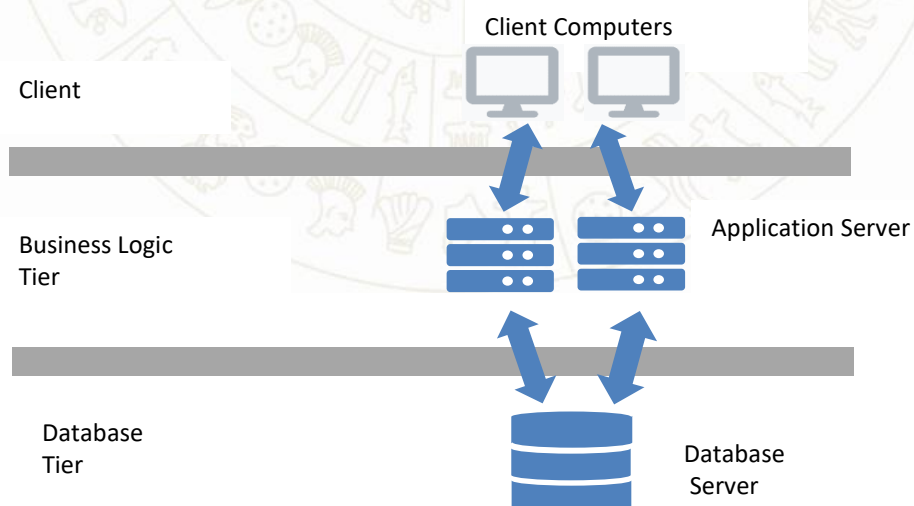
The three major system components are:

(1) The Database Server Tier: It is the most important tier of the system. It provides all the necessary functionality for storing, retrieving, updating and maintaining the data, as well as the necessary mechanisms

to ensure data integrity. Storing large amount of data does not affect system performance. The Database Server Tier in implemented in "eXist" - an open-source software.

(2) **The Business Logic Tier:** it is the main component of the software, where all but the processes that are related to the configuration of the user interface are executed. The functional components use the technology of Web services (http://www.w3.org/2002/ws/), a software system recognized by a URI *[IETF RFC 2396]*; its interface of and the actions it performs are completely defined and can be described in an XML format.

(3) **The Client Tier:** the level where end-users interact with the system (user interface). The management of user screens and data formatting take place at this level. The client software is a web application accessible from all browsers (Internet Explorer, Firefox, Chrome, Opera, Safari), using technologies like HTML5, CSS, javascript.

Summarizing, the system architecture features are:

- ✓ 3-tier architecture
- ✓ low-cost addition, removal and updating of functions
- ✓ additional categories of cultural documents cab be documented at low cost
- ✓ remote access
- ✓ updating the platform is cost free
- ✓ can interface with other museum networks and cultural organizations
- ✓ open-source software

Data exchange

SYNTHESIS-CORE provides data exchange programmatic interface. The data exchange can be achieved through the SYNTHESIS-API (REST-API), which offers basic functionalities of searching, accessing and managing content. Furthermore, it allows data extraction and reuse in other content management systems and/or other databases (such as, RDBMS, noSQL, triplestores, etc.).

Available deployments

SYNTHESIS-CORE can be used for documenting cultural assets in the form of:

- **a single-user system** for those people wishing to document one or more sets of cultural objects that form part of a collection or not.
- **an individual system for an organization** (museum, cultural institution or group, etc.) wishing to document one or more sets of cultural resources and activities. The documentation may be carried out by one or more of the organization's members.
- **a "federated" system**, in the sense that many collaborating organizations can jointly work, under the supervision of one institution among them, acting as the system administrator, who is tasked with creating new organizations and administrators. Organizations can document sets of cultural objects and collections in their own databases. Organizations come with their own administrator and users. Each organization's administrator is responsible for managing its own users and documents.

Extensions of SYNTHESIS-CORE

- **In relation to the scientific documentation entities**: SYNTHESIS-CORE can be easily expanded and specialized for other types of cultural assets, such as archives, books, works of art etc. This entails the creation of new schemata for the description of these new documentation entities.
- **In relation to the presentation entities:** The system can also be easily expanded with respect to the presentation of the stored data. For more information see [BEKIARI 2014].
- **In relation to the languages used:** SYNTHESIS-CORE can support a large number of languages. So far it supports Greek, Arabic, English, Italian, French, Dutch and Swedish. Adding a new language in SYNTHESIS-CORE entails the translation of the UI, the entities' name and their functional / information units, fields and some built in controlled vocabulary in this language.