A Framework for Supporting the Workflow for Archaeo-related Sciences: Managing, Synchronizing and Analyzing Data

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1. **Data Gathering:**
   Saving of archaeo-related data digitally in a database.

2. **Data Sharing:**
   Collaborating with colleagues and sharing data with other users.

3. **Data Analysis:**
   Executing analyses on the available data.
Development and Implementation of the xBook Framework

**Background:**

- Workflow is similar in all disciplines
- Collected data is different in each special field.

**Challenge:**

- Provision of a generic database solution for all disciplines
- As customizable as possible to allow required information about the specific data to be gathered

→ **xBook**, a generic open-source framework including the common and basic features for a database for archaeo-related disciplines
Data Gathering (II)

xBook Framework

- Registration for users (User Management)
- Gathered data is separated to single data groupings (Projects)
- Dynamic and flexible Data Entry Mask that provides reusable input fields; custom input fields can be added to each Book
- All data can be displayed as a table form (Data Listing)
- Data Search to filter available data with specific terms or values
- Entered data can be exported to Excel Sheets / CSV (Exporter)
- Project Right Management to share data with specific users.
- Update Function to update program version / database scheme
- Wrapped into a common GUI which structure can be reused
Data Gathering (III)

OssoBook

ArchaeoBook
Synchronization of Data

Background:
• Collaborating/sharing data with others required, or storing data
• Working offline must be possible:
  – data must be synchronizable to the global server at any time
  – updated/added entries must be synchronized to the local db
• Existing synchronization methods do not fulfil all requirements

Challenge:
• Creation of a Synchronization process
Synchronization: Concept

- Uses timestamps to keep track of the last time the entry was updated in the global database.
- Status is saved for each entry in the local database:
  - *synchronized*, if the entry was not updated locally
  - *updated*, if the entry was updated locally
  - *conflicted*, if a conflict was detected
    (when entry is updated on two different local databases without synchronizing the entry in between)
Synchronization: Implementation

- Each update of an entry updates sets the status to *updated*.
- Start of synchronization process: each input unit is checked which entries are not synchronized.
- The single unsynchronized data sets are
  - sent to the server
  - updated on the server
  - the status is set to *synchronized* locally (if no conflicts occur).
- A trigger on the server sets the timestamps to the current time, every time an entry is uploaded or updated.
- If there is no unsynchronized entry left the entries are synchronized back to the local database.
Data Sharing (IV)

OssoBook - Version 5.4.3

Local projects
- Aalen (2266) [Hannes Napierski [OK]]
- Didyma (914) [Hannetzi Obermaier [UNSYNCH]]
- Eliphasen gsnmt (16219) [Hannetzi Obermaier [OK]]
- Gürke I 1997 (351) [Nadja Pöllath [DIFF]]
- Gürke II 1997 (350) [Nadja Pöllath [DIFF]]
- Millet Athena (3521) [Hannetzi Obermaier [DIFF]]
- Millet Bothros (3272) [Hannetzi Obermaier [OK]]

Global projects (Server)
- Göteborg Tape (413) [Ansgar C (1299) Nadja Pöllath]
- Göteborg Tape (433) [Ansgar C (1299) Nadja Pöllath]
- Göteborg Tape (412) [Ansgar C (1299) Nadja Pöllath]
- Gürke I 1998 (355) [Nadja Pöllath]
- Gürke II 1995 (3291) [Nadja Pöllath]
- Gürke II 1996 (2866) [Nadja Pöllath]
- Millet Athena (34935) [Hannetzi Obermaier]

Synchronisation

You can use the synchronisation to download projects that are saved on the eBook server to your local database. You only have access to your own projects and to projects for which you have read and/or write rights.

Additionally, you can use the synchronisation to upload your local projects to the eBook server. This is necessary if you want to share your projects with other users. Furthermore, you can recover your data in case of a local loss of data.

If you have activated the automatic synchronisation in the settings, your local projects are synchronised with the eBook server by default.

To download projects from the server to your local database, please select the desired projects at 'Global projects' and click on 'Synchronise'.

If the automatic synchronisation is deactivated and you want to synchronize your local projects with the eBook server, please select the projects at 'Local projects' that you want to save on the eBook server and click on 'Synchronise' afterwards.

The data will be synchronised in the background so you can continue using other areas of eBook.
Embeddable Analysis Tool

**Background:**
- Use of extern analysis tools is still common practise
- This method is aggravating, time consuming, error-prone

**Challenge:**
- Providing a dynamic, flexible, and powerful tool that allows specific queries from (archaeological) databases without having any prior knowledge of programming
- Must be embeddable to existing Java applications

→ Development of the **Analysis Tool**
Analysis Tool: Concept

- Some functions have to be implemented by the application (e.g. the Analysis Tool cannot know how the data is stored, or how the connection to the data is realized)
- Provides a set of standard components to handle the data
- API to allow new specific components to be registered to an application
- Components have inputs/output – can be connected by the user
- Once a composition is completed, the result can be calculated and be viewed in tables or diagrams
- Generic communication between the components (connected components are not known beforehand)
Example: Simplified composition of the age distribution of animals
Example: Percentage of the most important livestock in settlements of the Heimstettener Gruppe (Heimstetten, Germany) in the 1st century AD, based on the number of bones.
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Discussion

Synchronization:
- Improvements of the performance necessary, e.g.
  - using compressing methods for the transmitted data
  - using special data type to decrease the size of the data
- Solution to be able to delete the file sets in the database

Analysis Tool:
- Currently an early stage of development!
- Creation of further Workers would extend the possibilities
  (especially Workers for predefined calculations)
- Frequent used combinations of single Workers may be integrated as own Workers
- Number of provided diagrams for the graphical representation
- Possibility to save, export, and share a composition
Thank you for your attention!

Questions...?