Software platform for managing experiments and the experimental data

bioWES

It is essential that scientific experiments should be reproducible (repeatable) because they are not random events observed in one laboratory. The experimental procedure should yield the same results in any place and at any time. Nevertheless, scientific journals are full of results that are impossible to reproduce. Upon detailed examination, it is often found that publications contain only an incomplete set of data selected from all the results achieved.

Scientific publications are not a good ultimate source of information for future application.

At the same time, mining large data is currently one of the most popular research directions. If published protocols vary between individual datasets, it is difficult to ascertain whether the observed difference is caused by changes in experimental treatments or differences in investigated samples.

It is inevitable that a detailed protocol is stored alongside with the dataset in all cases.

The bioWES platform, designed for simultaneous data and experimental protocol storage, provides a solution to fundamental problems of contemporary research.

Opinions of the extent to which the protocol has to be detailed and what to include will develop in the course of work itself and in interactions with other laboratories which utilize developed results and procedures. In addition to solving problems with reproducibility of extraction of large data, bio**WES** offers the possibility of understanding how knowledge in the given experimental direction is acquired and how opinions of the results develop. This functionality has a potential for significant acceleration of experimental work.

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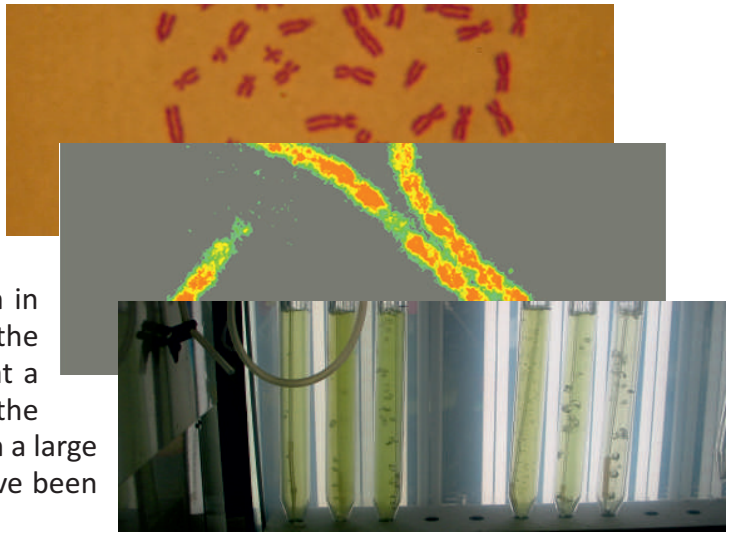
dataPartner

Example of a supported application for biological research

Biological research which examines population, organisms, cells and their components in order to obtain new knowledge to improve health care or efficient food production is one of the priorities of modern scientific research. Results of biological research are published in dozens of magazines, and the scientific level of individual researchers, teams and departments is reviewed according to these publications. The need to publish rapidly positive results is motivated by personal growth in one's scientific career and by gaining funds provided for the research. However, at the same time, it is observed that a large part of experiments is not easily reproducible. As the research shows, this is typically due to a failure to publish a large set of related experiments (when only selected ones have been published), which causes distortion of the results.



An article published in Nature Reviews Drug Discovery in 2011 (F. Prinz et al., 2011) states that the German pharmaceutical company Bayer Healthcare claimed that for 67 selected published projects, 47 of which were in the field of oncology, they were able to reproduce fully as few as 25% of the results. The American pharmaceutical company Amgen came to even worse numbers: 11% in their own evaluation of 53 works in the field of hematology and oncology (CG Begley & Ellis LM 2012) 2011.

In the long term perspective, this situation is hardly sustainable and it can be expected that a proven reproducibility will become a prerequisite for publication in prestigious journals. A much greater problem arises in the transfer of research results into industry for the development of a new technology.

Software platform bioWES is the solution

Existing information systems for supporting experiments focus primarily on planning processes and research logistics. Platforms bio**WES** does include these aspects but instead its focus lies mainly in the support of the experimenter, the persons responsible for running of the laboratory, results of the laboratory and their reproducibility. bio**WES** protects the laboratory manager and his or her team, as it ensures reproducibility and general results.

- ☞ reduces the possibility of absence of records of important experiments ☜
- ☞ improves the description of experiments and increases their completeness ☜
- ☞ supports a unified standardization of scientific terminology ☜
- ☞ accelerates the implementation of experimental and production processes to an accredited laboratory and industry ☜
- ☞ flexible refilling of automated functionalities for processing and storing data in the experiment report is provided by means of plug-in modules ☜

Why the software platform bioWES works

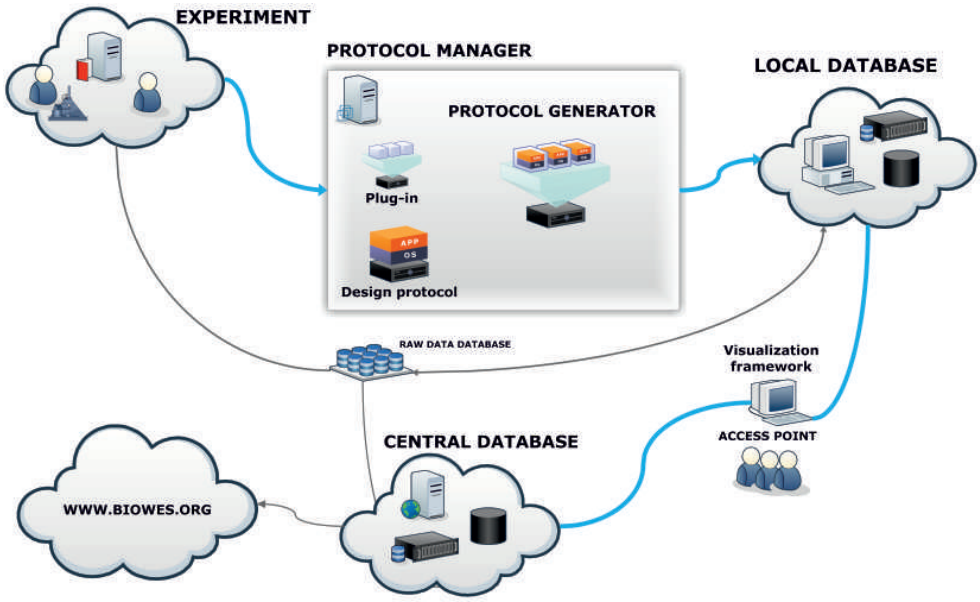
bio**WES** offers a simple and effective form of performing the acquisition and management of data generated during experiments, including descriptive information about experiments and their mutual relations.

This, in addition to repeatability of experiments, ensures that their results will be shared in the form of protocols including as a complete description of measurement as possible (for example, device settings).

Components of the software platform bioWES:

Protocol Manager:

The main part of the system. It supports insertion of terminology and ontology from international and local databases and loading of plug-ins for automatic instrument setting storage and data management.



Protocol Generator:

A tool for capturing experimental data and descriptive protocols. Further, the tool allows designing of own, user protocols (protocol templates). Outputs in the form of experimental protocols are generated.

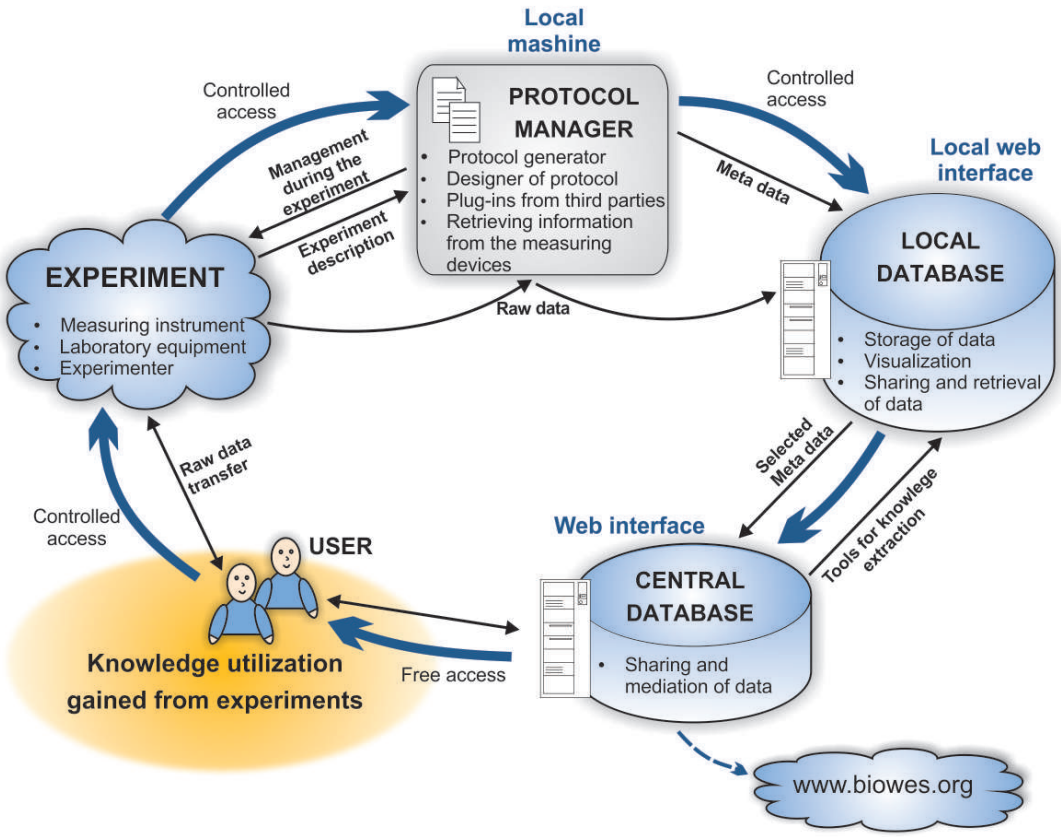
Central database:

Information system for sharing protocols of experiments. The central database provides a web portal for results and experiment sharing.

Local database:

Provides a secure storage of data acquisition and protocols. Protocols and data can be examined, processed, monitored and shared inside and outside the laboratory, based on access rights.

The principle of working with software platform bioWES:



The main benefits of application:

☞ Costs Reduction

Application of data and results of experiments with their descriptions, stored in a shared repository, reduces the need to repeat the same or similar experiments.

☞ Standardization and Genealogy of experiments

Ensures a precise repeatability of experiments according to standard parameters of the method description which leads to a better comparability of data. Genealogy monitoring and record of interdependence of experiments allow analyzing of development of methods and thus leads to the development of knowledge in the experimental direction.

☞ Research group data storage

A systematic storage of experimental data obtained by researchers facilitates the use of data even after their departure from the workplace.

☞ Saving of laboratory animals

New regulations on the protection of animals and emerging ethical requirements provide for a reduction in the number of animals used in experiments. This is achieved by removal of duplicates and a better experiment planning.

☞ Scientific cooperation support

It is possible to carry out publication and result sharing worldwide in a simple way.

Software platform bioWES is developed, implemented and supported by

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