

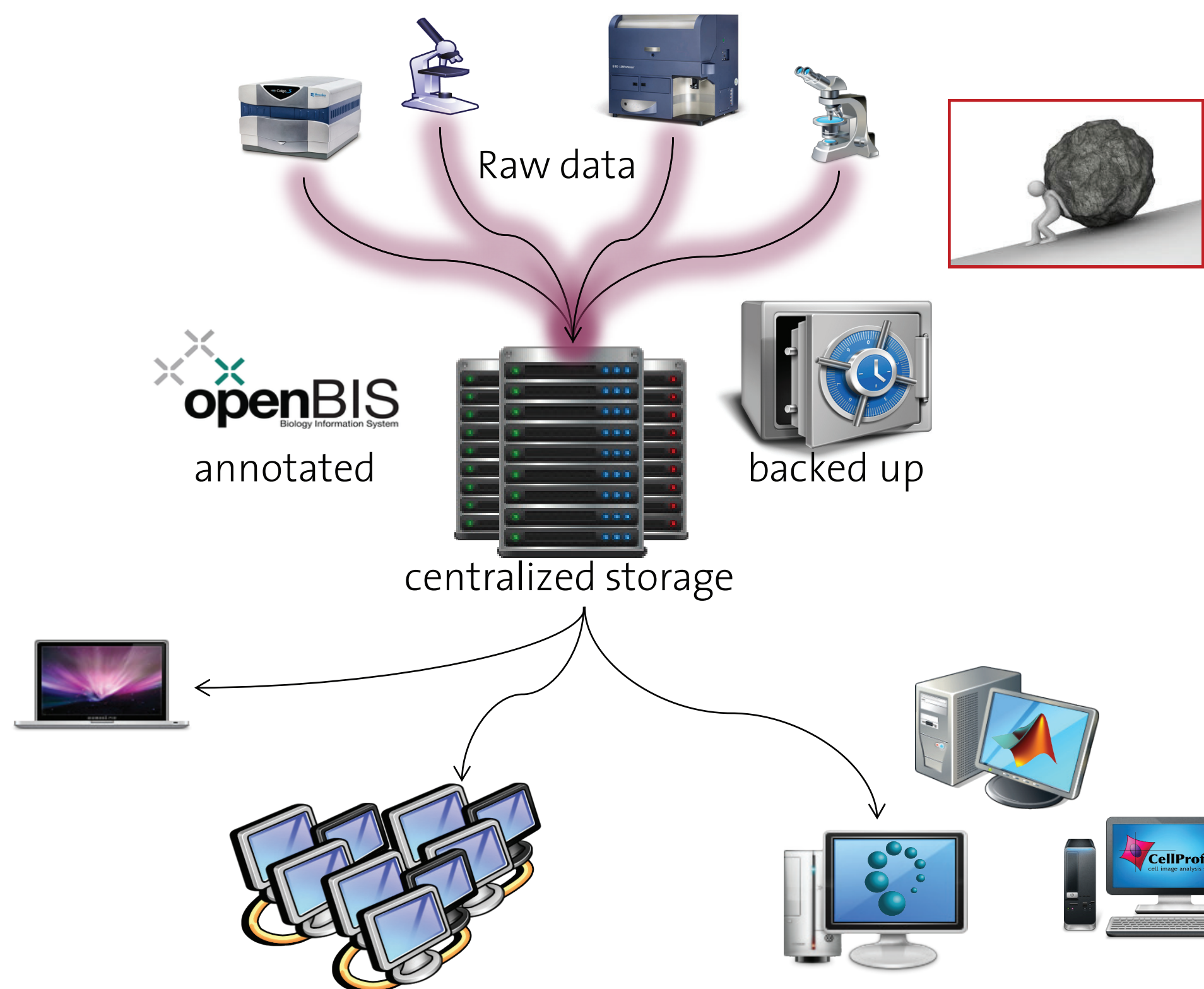
# openBIS Importer Toolset

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## Abstract

openBIS<sup>[1]</sup> is an extensible, open source software framework for constructing user-friendly, scalable and powerful information systems for data and metadata acquired in biological experiments. It enables users to collect, integrate, share, publish data and to connect to data processing pipelines. The **Single Cell Facility (SCF)**<sup>[2]</sup> is a centralized scientific facility at the D-BSSE<sup>[3]</sup> that provides equipment in the areas of flow cytometry, advanced automated microscopy and laboratory automation and maintains a department-wide openBIS installation for the management of all data generated on the facility's acquisition stations.

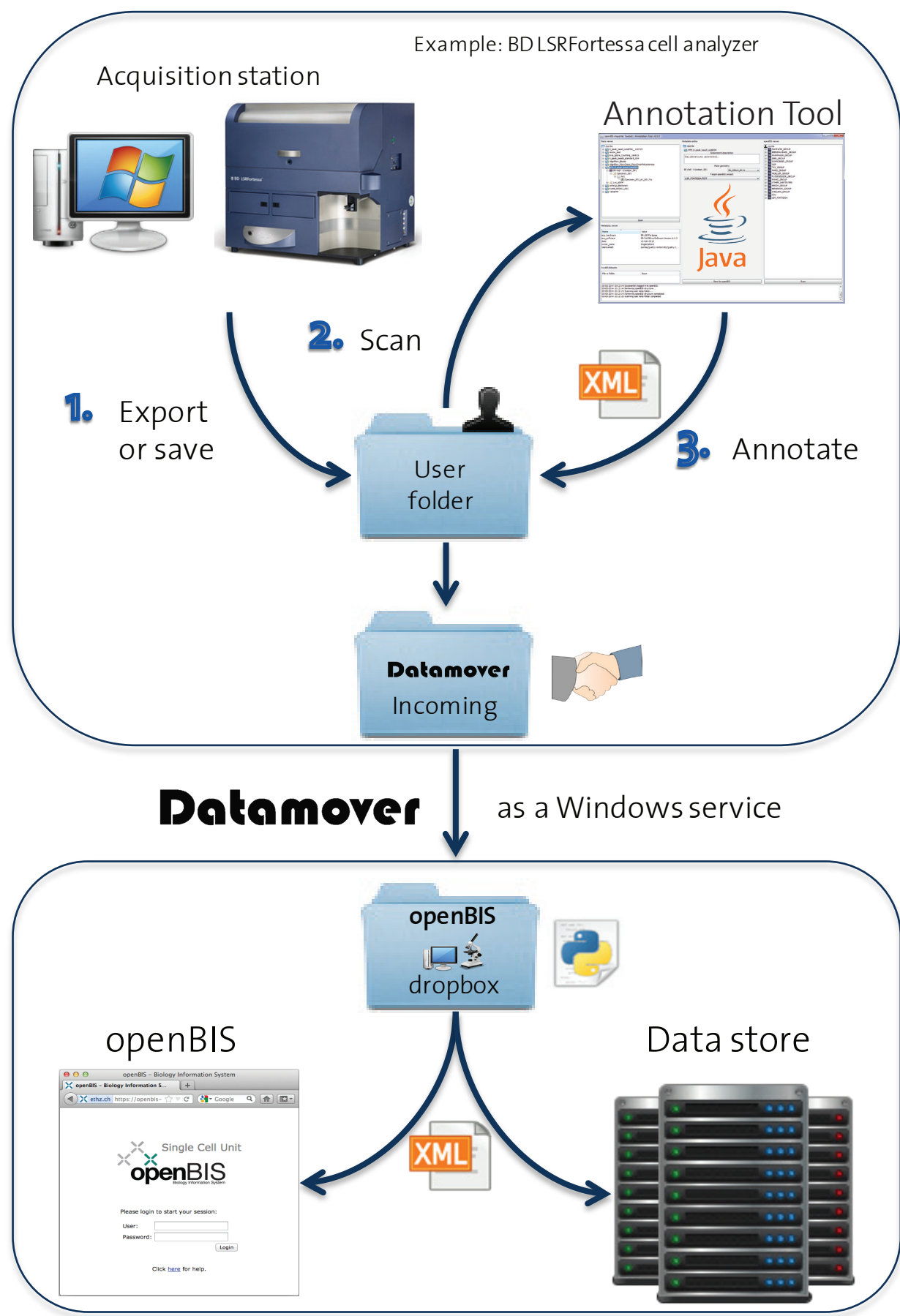
The **openBIS Importer Toolset (oBIT)**<sup>[4]</sup> is a tightly integrated collection of tools that allows for the semi-automated, semi-supervised registration of annotated datasets into openBIS directly from the acquisition stations.



The SCF provides centralized, secured storage for all the raw data acquired in the facility. Data and associated metadata are registered in a department-wide installation of openBIS directly from the acquisition instruments via the openBIS Importer Toolset and can easily be accessible for further analysis and processing work on high-end workstations and dedicated processing servers provided by the SCF or on users' own computers.

## Workflow

The registration workflow below is common to all the supported hardware. Currently, oBIT supports the most common flow cytometers and microscopes.



The **openBIS Importer toolset** is composed of several tools and applications:

The **Annotation Tool** guides the user in the process of data registration into openBIS.

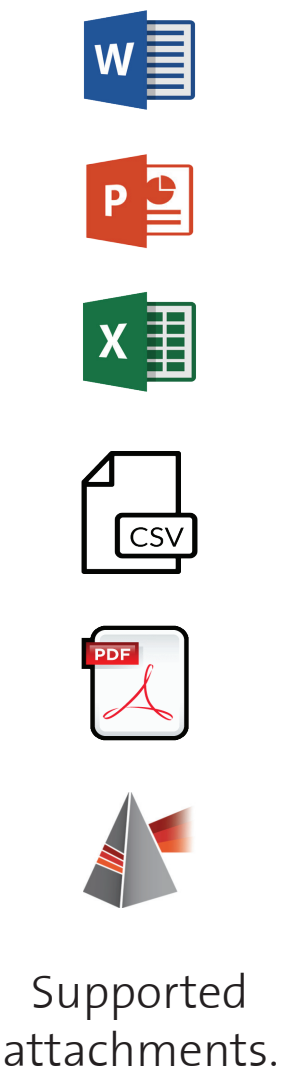
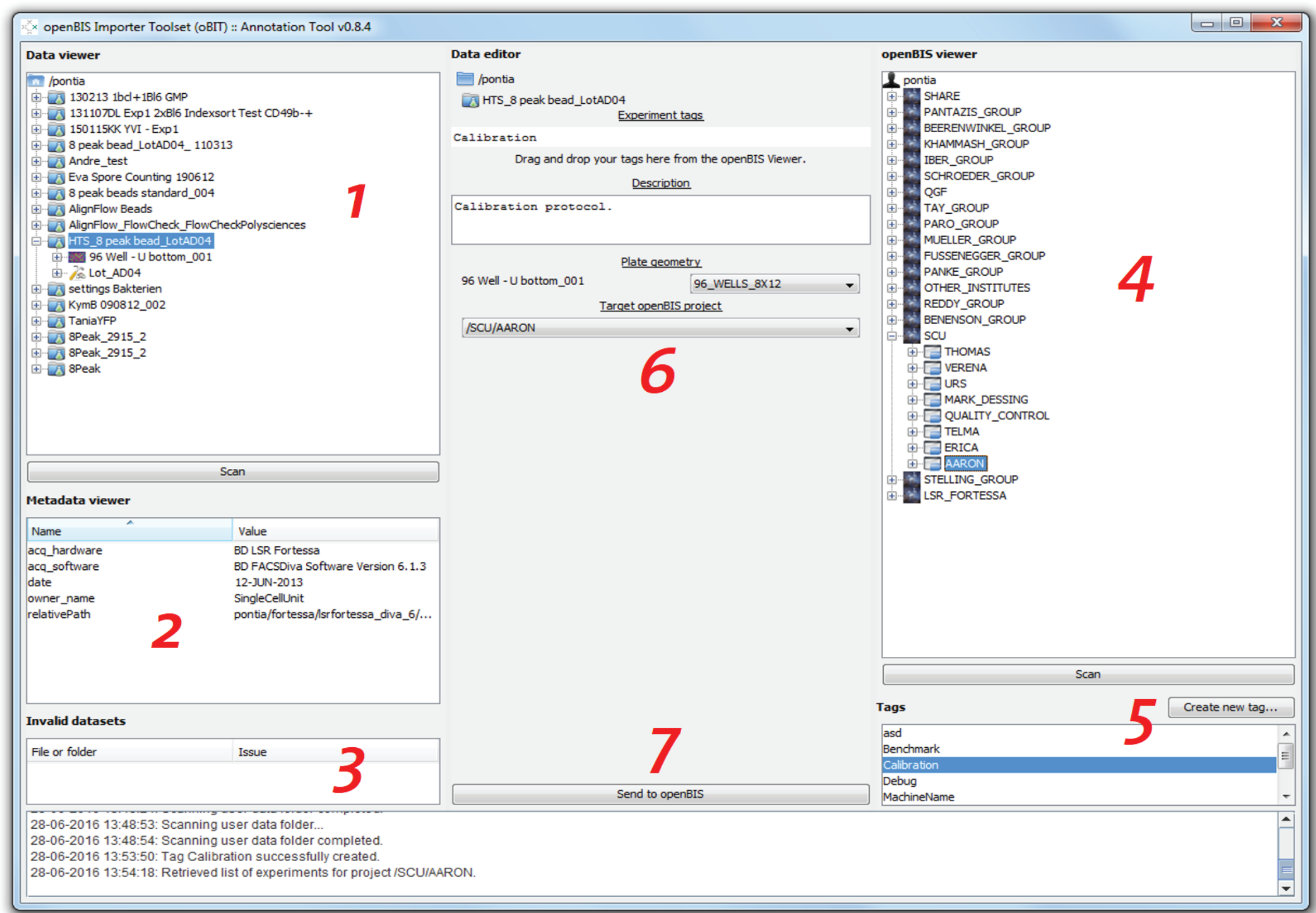
**Datamover**<sup>[5]</sup> is a program that takes care of moving typically large amount of data to a (usually) remote central storage. Running in the background, it checks for new, incoming data periodically and starts the moving process when triggered (by the Annotation Tool).

The **openBIS dropbox** feature makes it possible for a script written in the python language to control the data set registration process on the openBIS Data Store Server. The Annotation Tool provides complex annotations to guide this registration.

**Customized HTML 5 web applications** in openBIS provide users with familiar visualization and analysis tools.

## Annotation Tool

The **Annotation Tool (AT)** scans the User folder and displays the experiments in the Data viewer (1). Attachments can be added to the experiment folder. Metadata is displayed in the dedicated viewer (2). If a file or folder is not correctly recognized by AT, it is listed in the Invalid datasets table (3). The openBIS viewer (4) displays all entities the user is permitted to access. Tags can be managed and assigned to experiments (5). In the Data editor (6), additional metadata is associated to the various experiments, and the target openBIS project is chosen for registration. When annotation is complete, the user clicks on Send to openBIS (7) and all information is saved as an XML file along with the experiments. The annotated data is moved to the Datamover incoming folder and then transferred to the openBIS Data Store Server after an additional validation step.



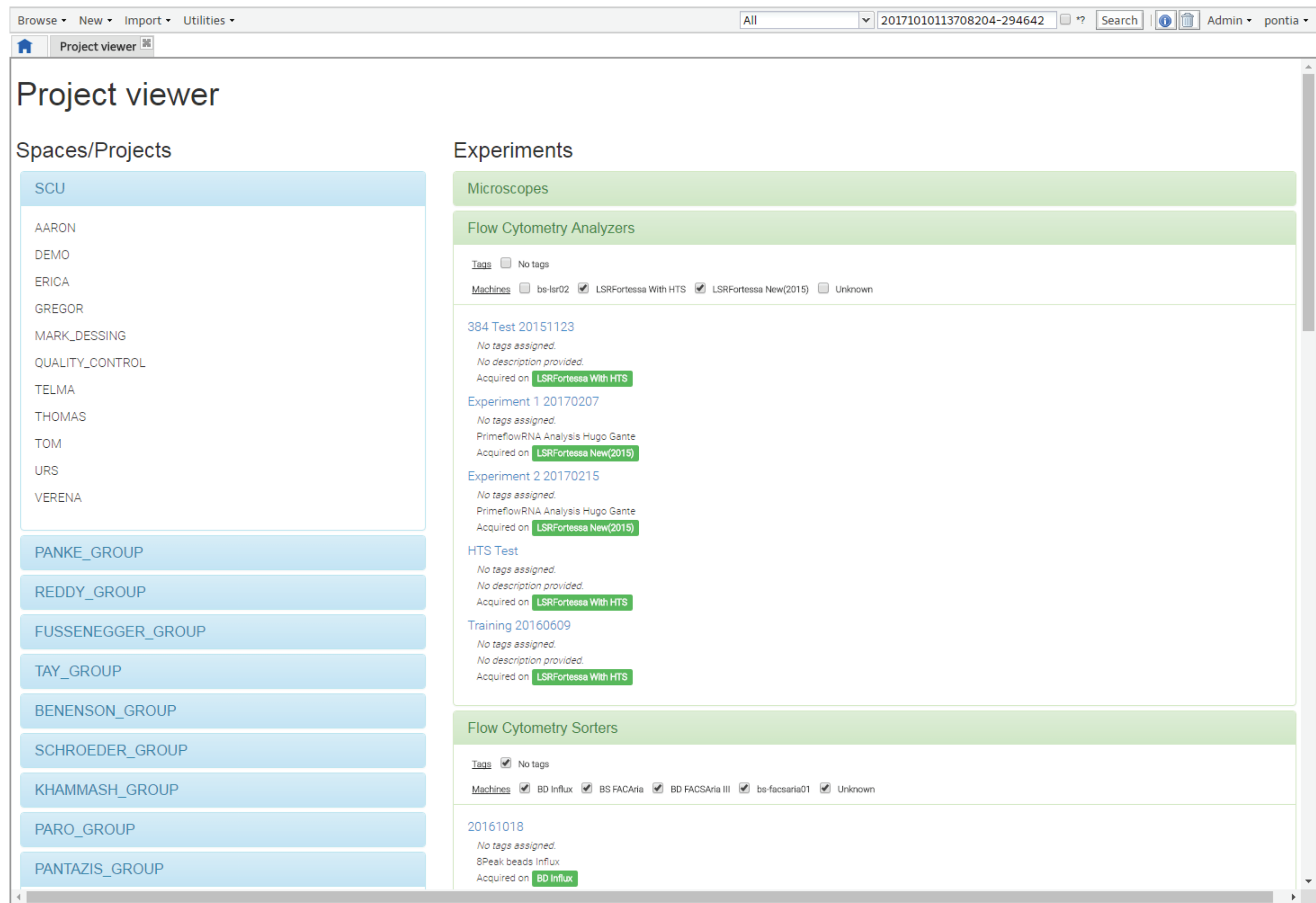
Supported attachments.

## openBIS custom views

openBIS can be extended with dedicated views and functionalities to support new data and instrument types. We have implemented core plug-ins for **flow cytometry** and **microscopy** that are now officially part of the latest openBIS version. Below, we show some of the implemented web applications.

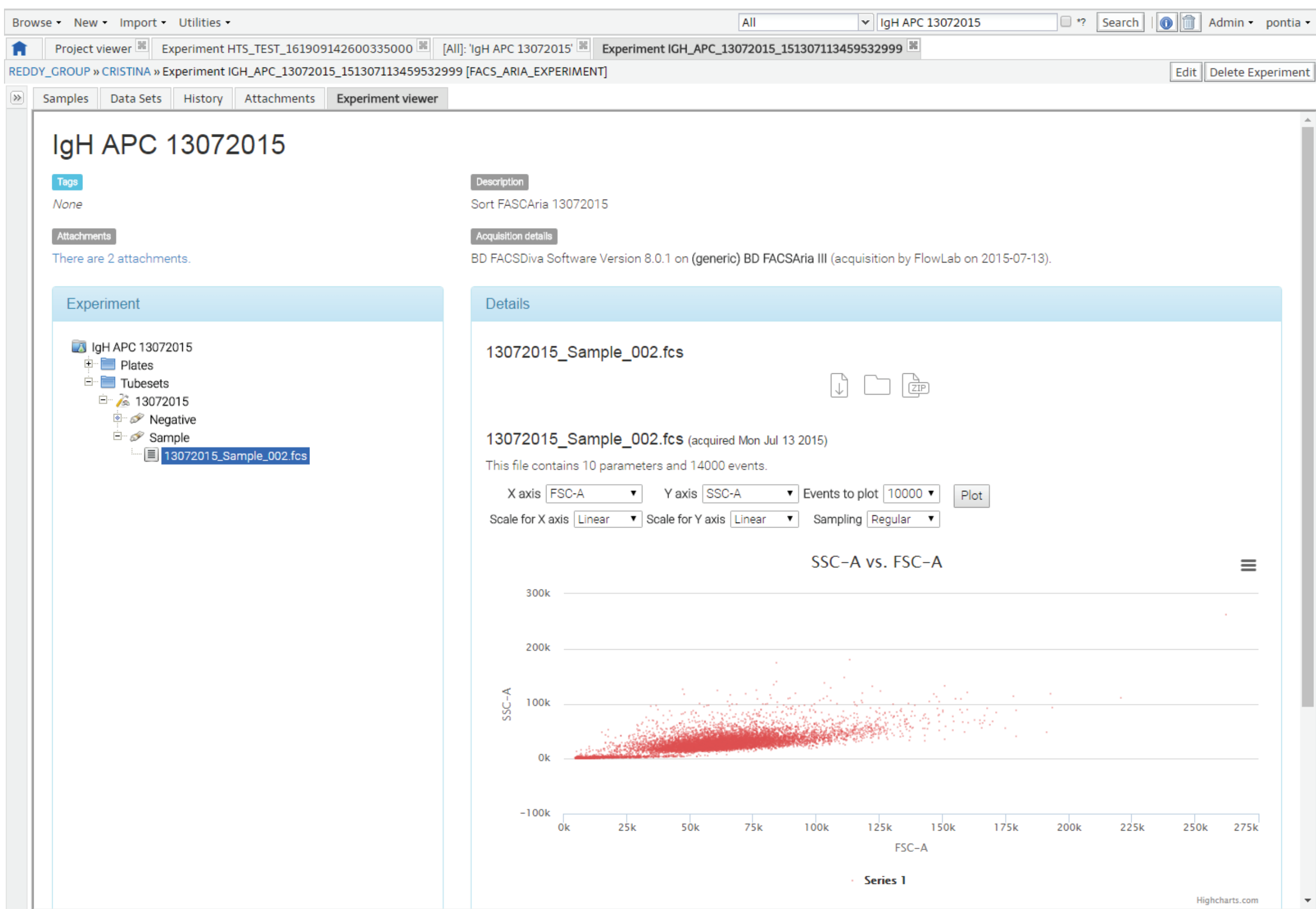
### Project Viewer

Gives an overview of all experiments organized by acquisition type. Tags and instruments can be used to filter the data displayed. Experiment names are links to the dedicated viewers.



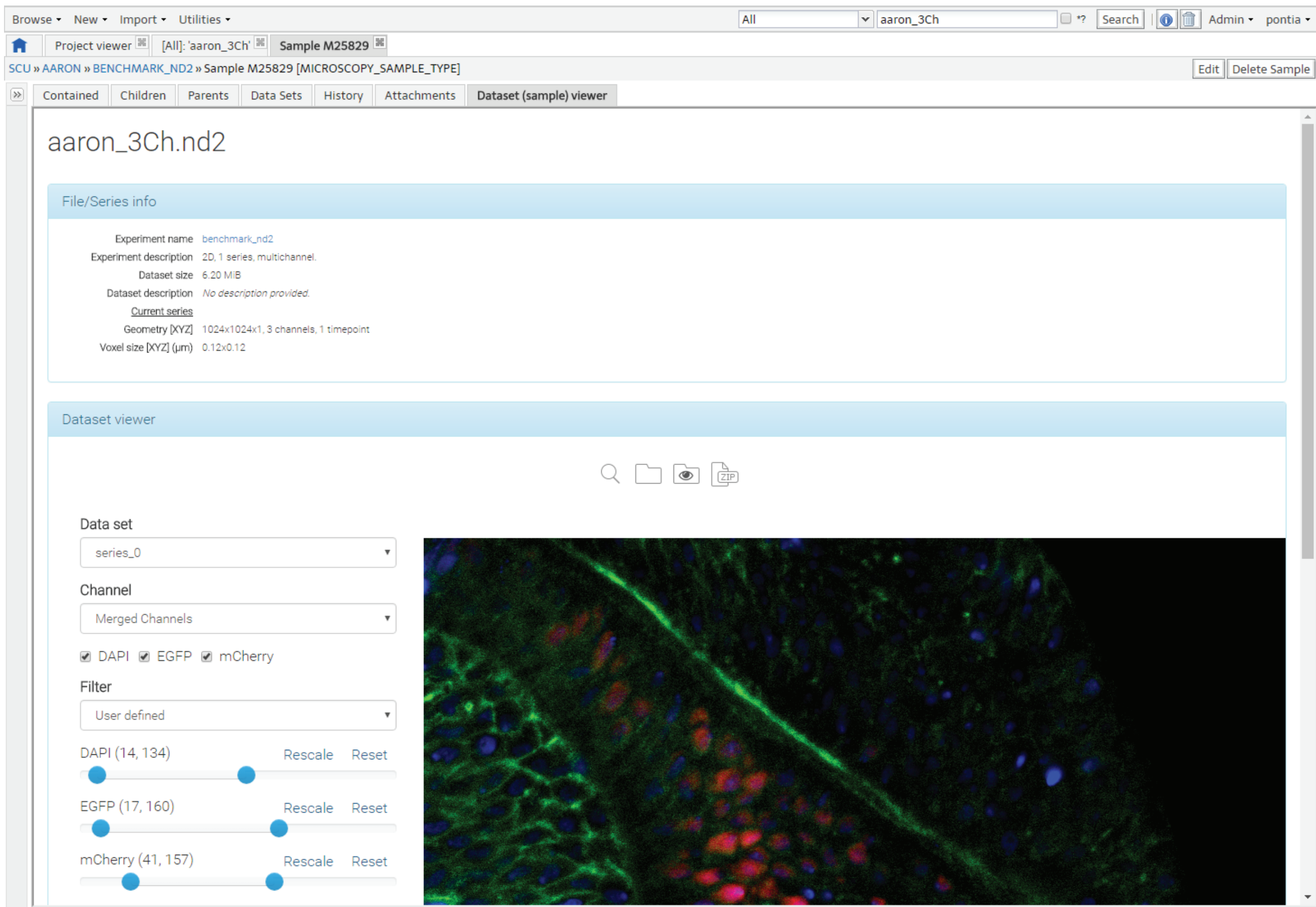
### Flow Cytometry Experiment Viewer

Recreates a familiar data organization (as in the BD FACSDIVA software). Allows exporting FCS files from the whole experiment down to single FCS files with just one click.



### Microscopy Experiment and Dataset Viewer

Experiment Viewer (not shown) organizes all datasets in a single experiment. Dataset Viewer allows visualization of individual images. Both offer various mechanisms to export data for subsequent analysis on dedicated workstations.



## Summary and outlook

In summary, we are developing tools to streamline registration of acquired data and metadata into openBIS directly from the acquisition instruments and to extend openBIS via custom views and apps for working with data. We are constantly expanding the set of supported instruments.

## References

- [1] <https://sis.id.ethz.ch/software/openbis.html>
- [2] <https://www.bsse.ethz.ch/scf>
- [3] <http://www.bsse.ethz.ch>
- [4] <https://wiki-bsse.ethz.ch/display/oBIT>
- [5] <https://wiki-bsse.ethz.ch/display/DMV/Home>