



openBIS Training

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<https://openbis-training.ethz.ch/openbis/webapp/elN-lims/?>



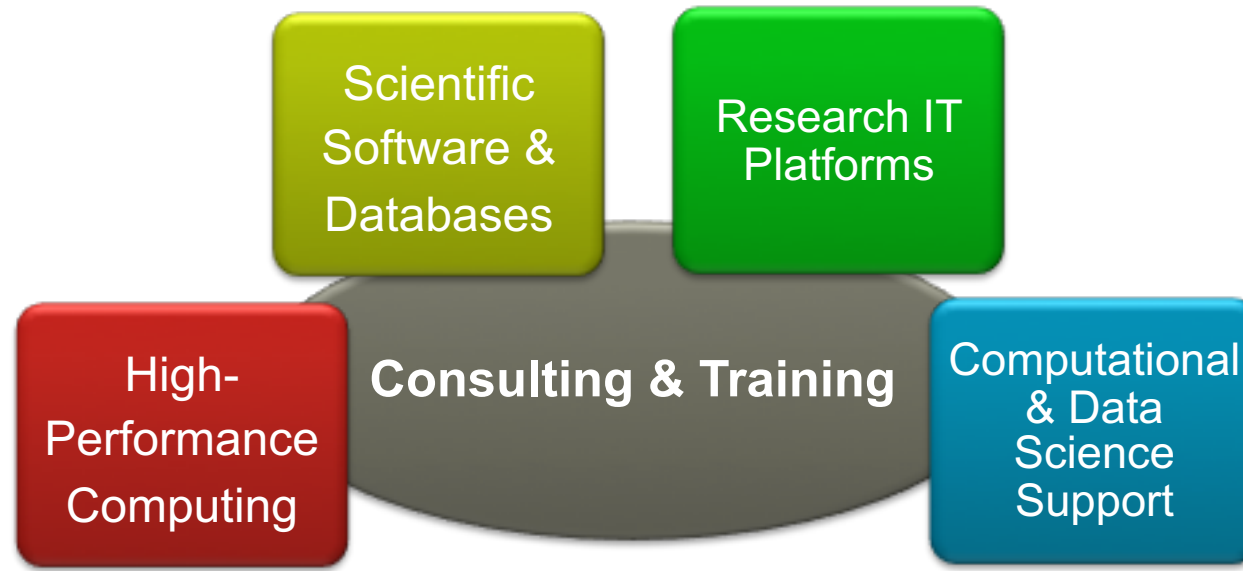
Overview

1. Overview of SIS
2. Overview of research data management with openBIS
3. Introduction to basic openBIS concepts
4. Hands-on tutorial:
 1. Registration of samples
 2. Registration of protocols
 3. Recording experiments and uploading data

Who is Scientific IT Services?

- We are a section of ETHZ IT Services since 2013
- We are about 40 experts in various areas of scientific computing
- We have a background in different areas of science

What do we do?



- High Performance Computing and Big Data Analytics
- Writing, maintaining and optimizing scientific software
- Research Data Management
- Building computational pipelines (reproducibility)
- Training, Consulting and Triaging of computing needs in research labs / for research projects

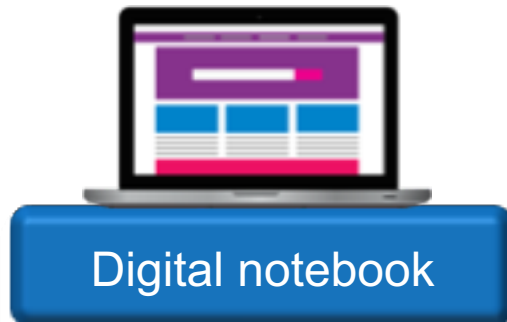
What is openBIS used for?

- openBIS is a software for:
 - ✓ Keeping track of lab materials



- ✓ Keeping track of lab methods

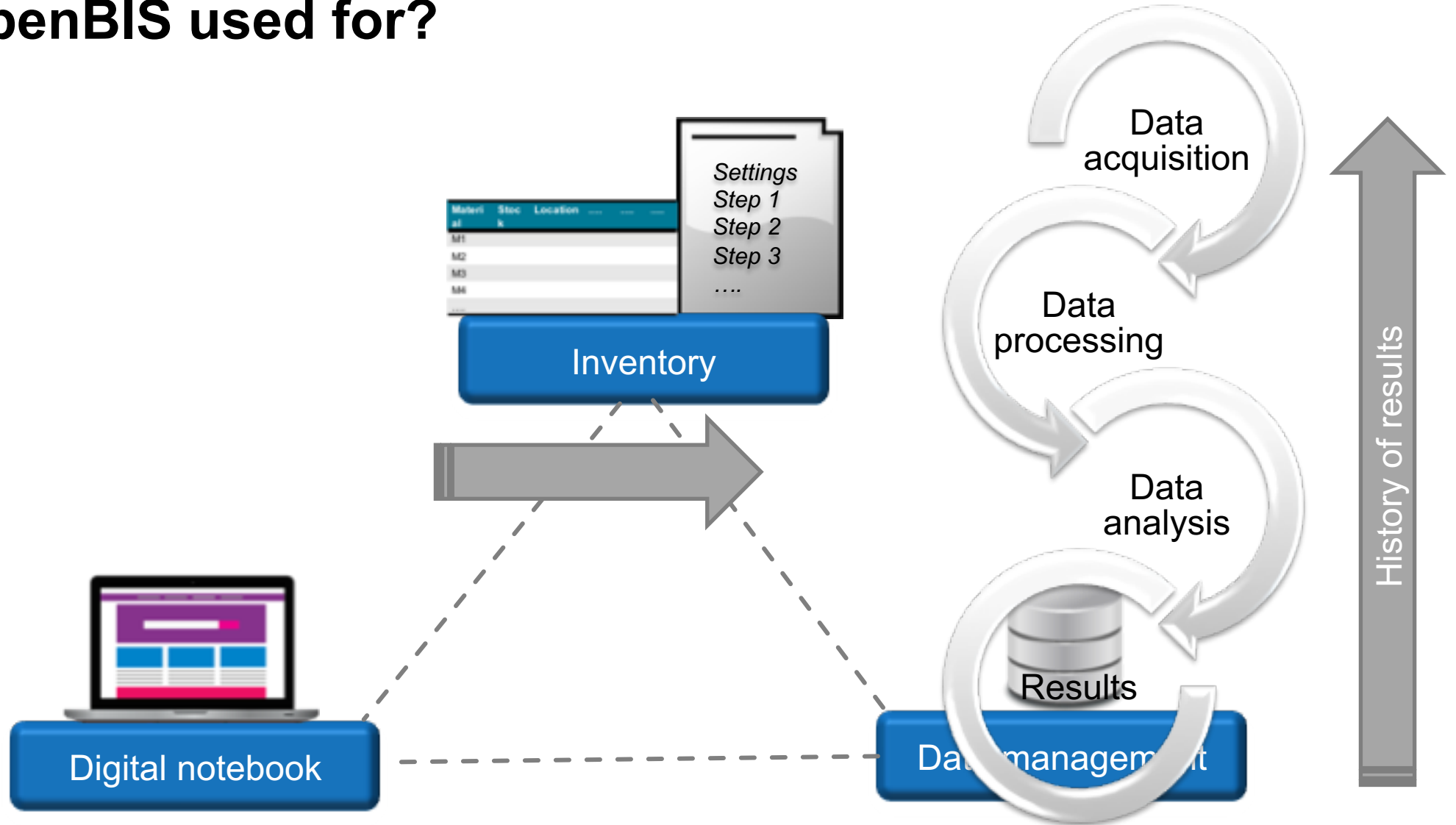
- ✓ Describing experiments



- ✓ Uploading data to experiments



What is openBIS used for?



National RDM service based on openBIS



University of
Zurich ^{UZH}



Cloud-hosted openBIS

- Virtual servers per research group
- Optionally with JupyterHub server for analytics

Self-hosted openBIS

- Support for set up on local IT infrastructure

Training & 'best effort' user support

- Optional: support contract with ETH SIS

SWITCHengines

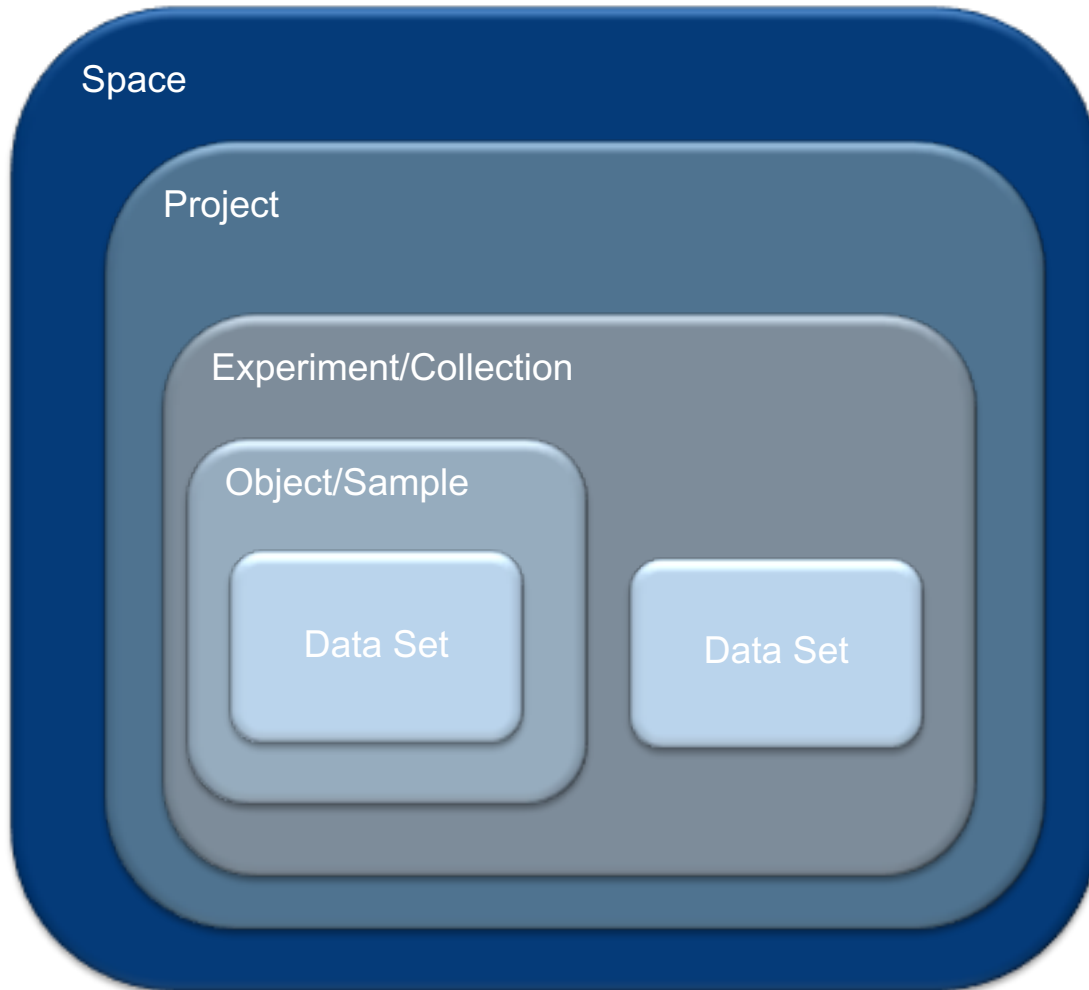
Current status @ UniBern



- 2 openBIS instances on SWITCHEngines:
 - Maintained by SIS
 - 1st level support provided by Science IT
- 1 local openBIS instance maintained by Science IT of UniBern
- From 2020 Science IT will have a support contract with SIS:
 - openBIS installed & maintained locally at UniBern
 - 1st level support provided by Science IT
 - 2nd level support provided by SIS

Basic openBIS concepts

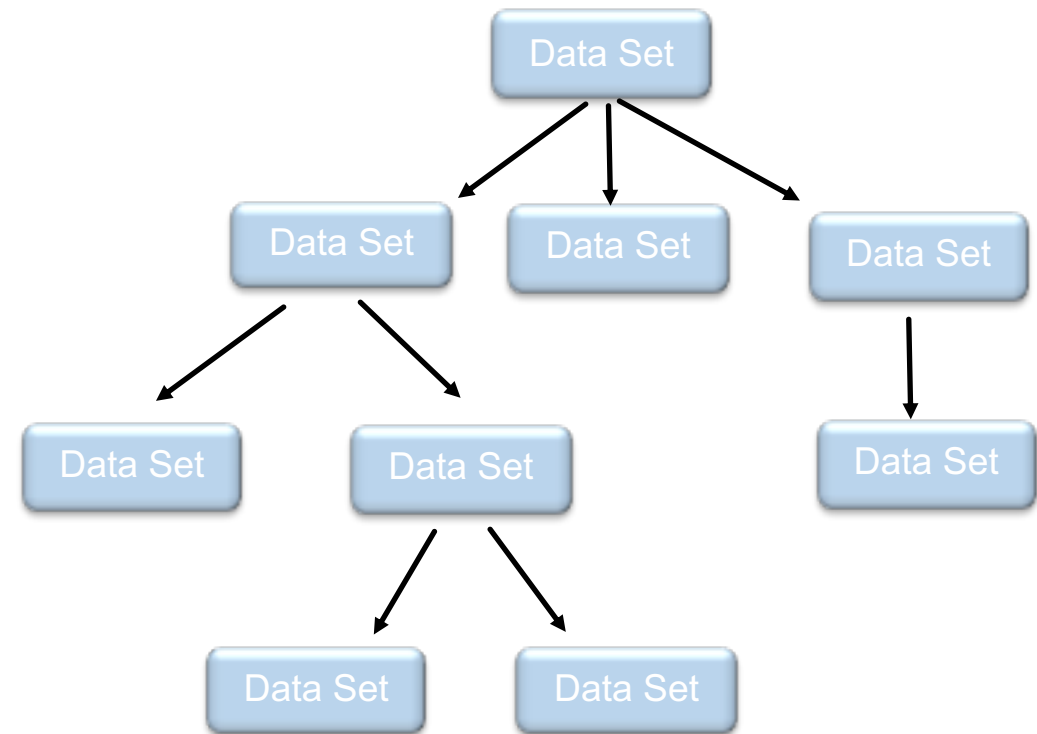
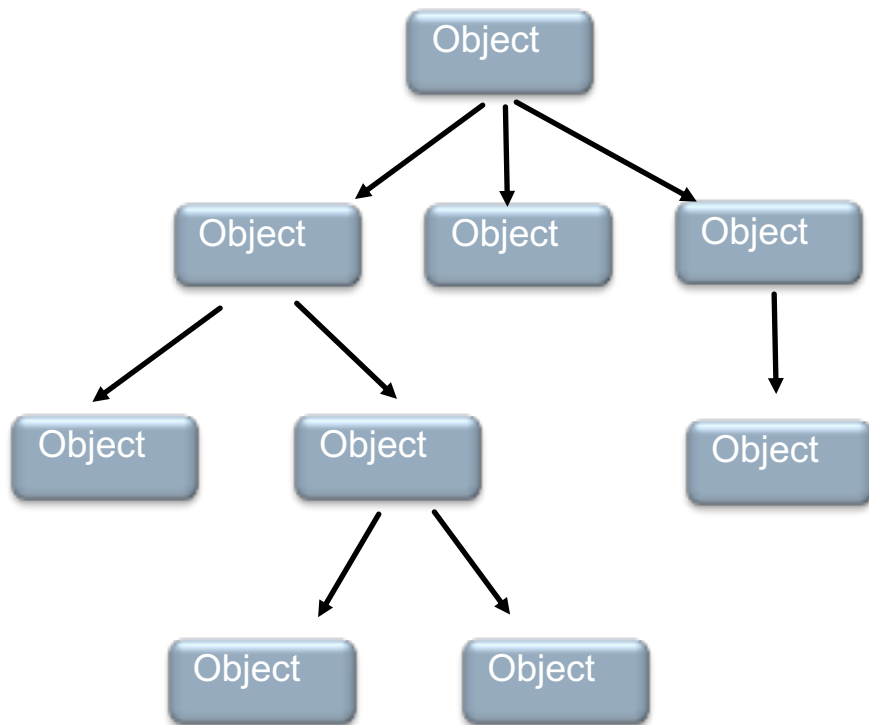
openBIS data structure



1. Folder with only code
2. Folder with code + description
3. Folder with code + user-defined properties. There can be several types of Experiment/Collection, each defined by different properties.
4. Basic entity with code + user-defined properties. There can be several types of Objects/Samples, each defined by different properties.
5. Folder for storing data files with code + user-defined properties. There can be several types of Data sets, each defined by different properties.

Linking objects and datasets

- Objects can be linked to other objects, datasets to other datasets with $N:N$ relationship
- In openBIS terms, these are “parent-child” relationships

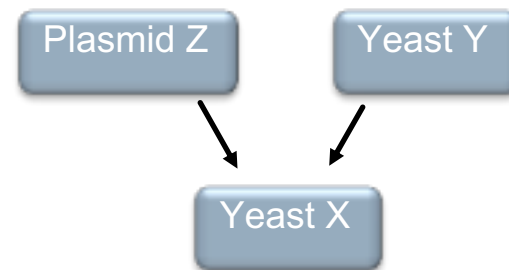


What are “parents” and “children”?

➤ They are a way of connecting entities together.

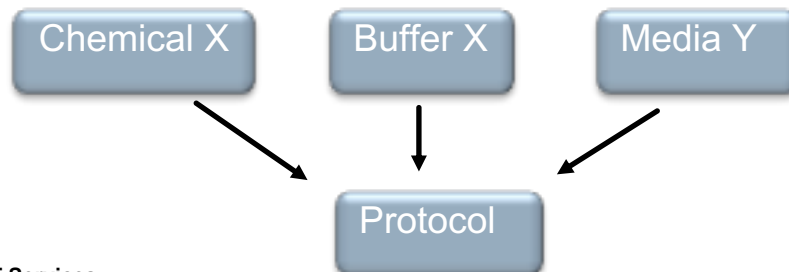
➤ Examples:

1. You make a sample from other samples.



***Yeast X** is made inserting **Plasmid Z** into **Yeast Y**. These are assigned as parents to **Yeast X**.*

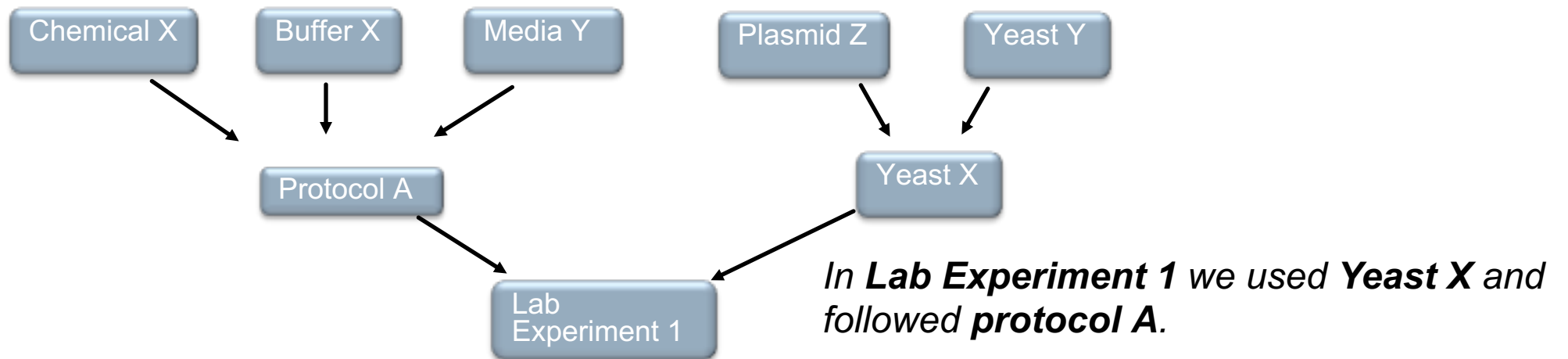
2. You write a protocol, and want to keep track of the samples used.



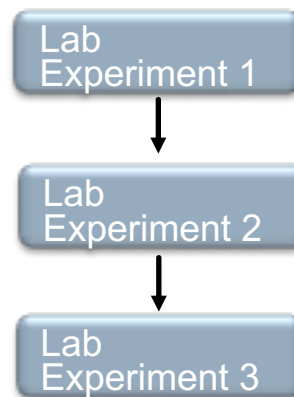
***Chemical X**, **Buffer X** and **Media Y** are needed to perform this protocol. They are parents of this protocol.*

What are “parents” and “children”?

3. You describe an experiment and you want to keep track of the protocol(s) and samples used



4. You make one experiment in several steps and you want to link each step to the previous one



Roles

| Role | Capabilities |
|------------------------------|--|
| Observer (Space or Instance) | Read-only access to given spaces or to the whole instance. |
| Space/Project user | Create + edit Object, Experiment. Edit Project . |
| Space/Project power user | User rights +create Projects . Delete object, experiment, project, datasets. Add, update vocabulary terms. |
| Space/Project admin | Power user rights+ list roles; create and delete space roles; edit datasets. |
| Instance admin | Space admin rights + create types. Has access to everything. |

Freezing entities

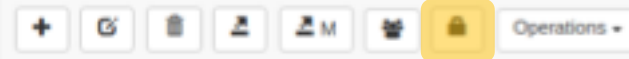
- It is possible to “freeze” every level of the openBIS hierarchy.

Space: DEFAULT_LAB_NOTEBOOK



Project: DEMO_PROJECT

/DEFAULT_LAB_NOTEBOOK/DEMO_PROJECT



Experiment: Demo experiment 1

/DEFAULT_LAB_NOTEBOOK/DEMO_PROJECT/DEMO_PROJECT_EXP_1



Object: Step 1

/DEFAULT_LAB_NOTEBOOK/DEMO_PROJECT/DEMO_PROJECT_EXP_1/EXP3



Dataset: test data

/DEFAULT_LAB_NOTEBOOK/DEMO_PROJECT/DEMO_PROJECT_EXP_1/EXP3/20190611123601400-54



Freezing entities

- At every level, everything below is always selected to be frozen. Selection can be modified.

Freeze Entity

Choose the entities to freeze (all by default):

| Selected | Type | Permid | Name |
|-------------------------------------|-----------------------|----------------------|----------------------|
| <input checked="" type="checkbox"/> | Space | DEFAULT_LAB_NOTEBOOK | DEFAULT_LAB_NOTEBOOK |
| <input checked="" type="checkbox"/> | Project | 20190528221459905-1 | DEFAULT_PROJECT |
| <input checked="" type="checkbox"/> | Project | 20190611122038970-49 | DEMO_PROJECT |
| <input checked="" type="checkbox"/> | Experiment/Collection | 20190611122056078-50 | Demo experiment 1 |
| <input checked="" type="checkbox"/> | Experiment/Collection | 20190528221459905-14 | Default Experiment |
| <input checked="" type="checkbox"/> | Object | 20190611122145679-52 | Step 2 |
| <input checked="" type="checkbox"/> | Object | 20190611122213447-53 | Step 3 |
| <input checked="" type="checkbox"/> | Object | 20190611122127059-51 | Step 1 |
| <input checked="" type="checkbox"/> | Object | 20190528221828470-42 | test |
| <input checked="" type="checkbox"/> | DataSet | 20190611123601400-54 | test data |

Enter your password to freeze the entities, after they are frozen no more changes will be allowed:

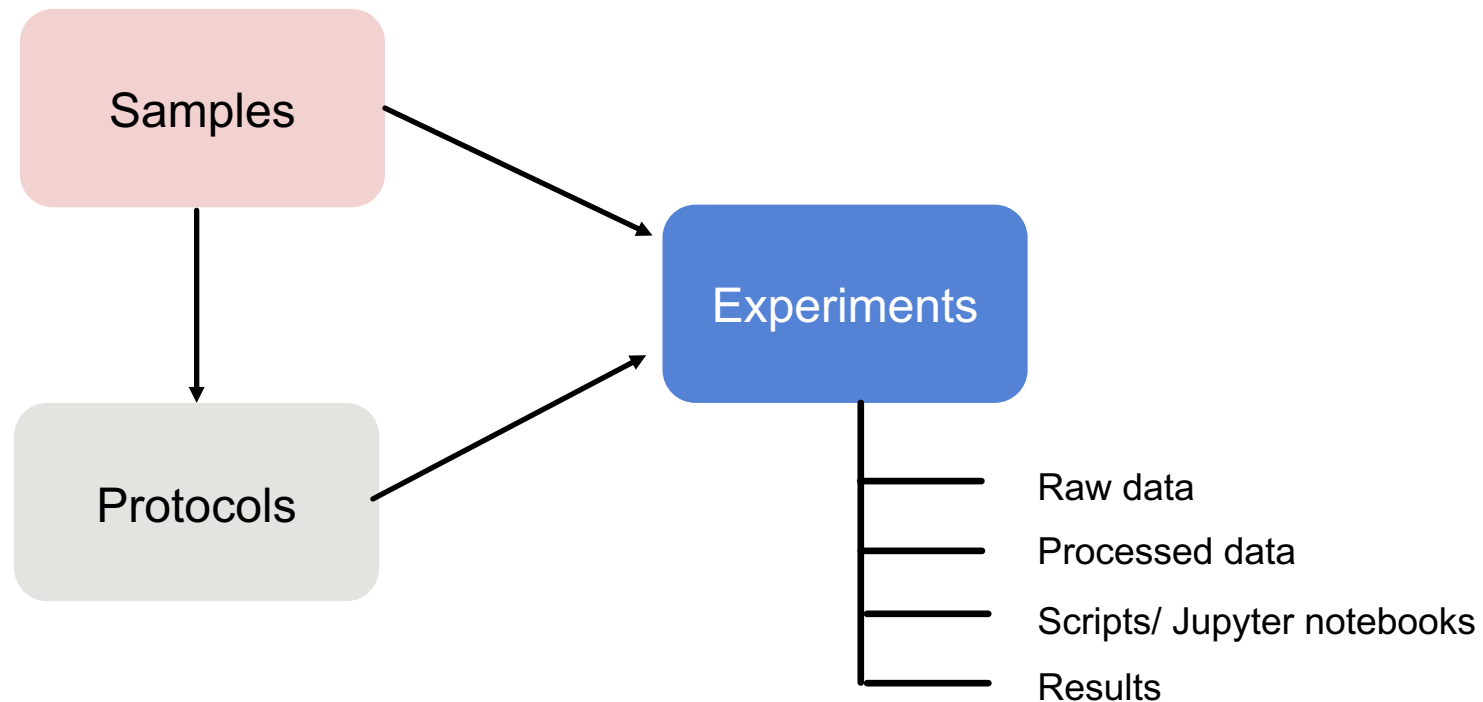
⚠ This operation is irreversible!

Password (*):

How to use the openBIS Inventory & Lab Notebook

Inventory

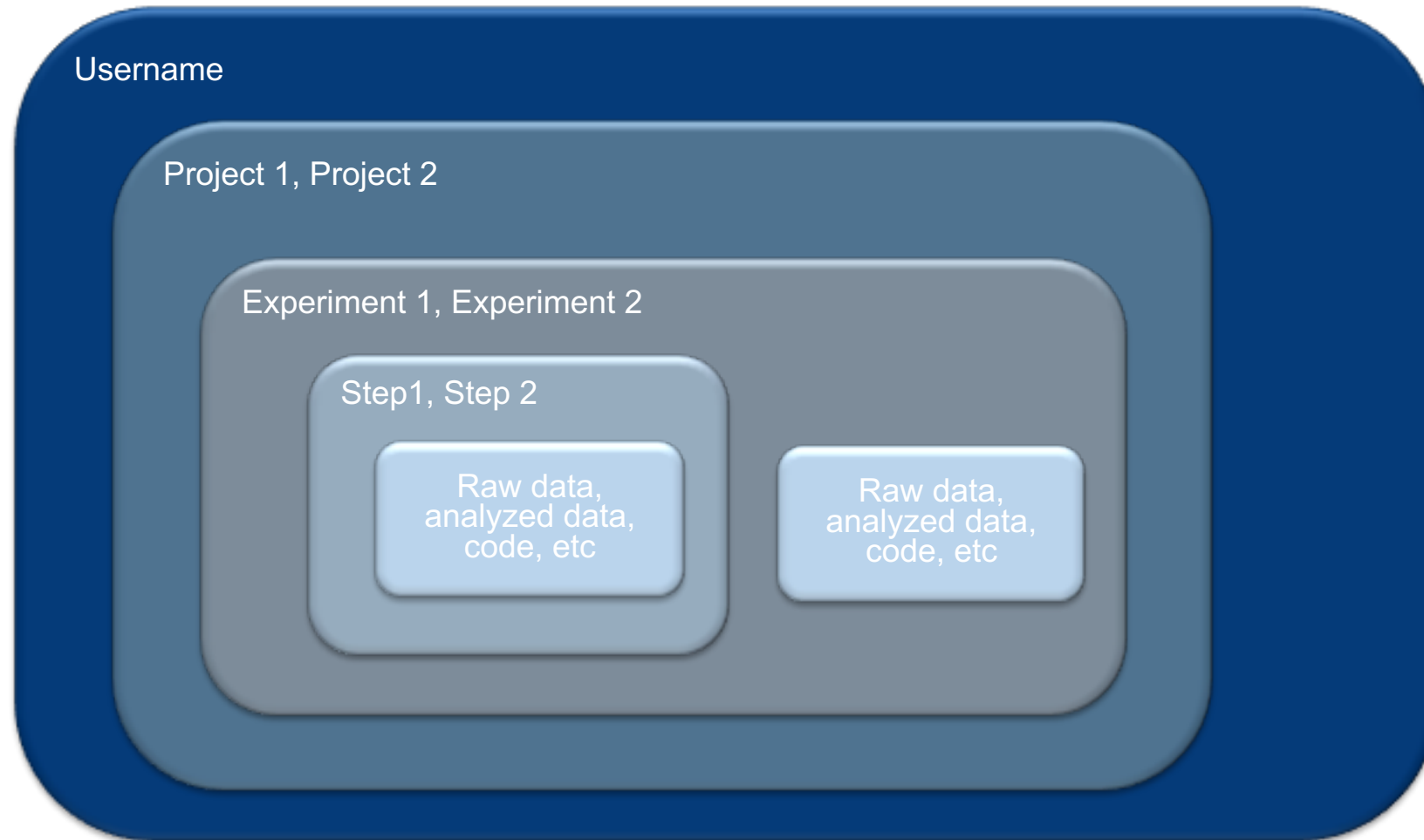
Lab Notebook



How to use the openBIS Lab Notebook

- In the Lab Notebook part of openBIS, usually each user has a **personal Space** where to organize **projects** and **experiments**
- Experiments can be divided in **Experimental Steps**
- **Experimental Steps** can be linked to samples, protocols, other Experimental Steps
- Data (raw, processed, analysed, final results) can be attached to Experiments or Experimental steps in **Datasets**

openBIS Lab notebook



Experiments and Experimental Steps

- An openBIS Experiment is a specific scientific question. The single attempts to answer this question can be modelled as Experimental Steps.
- Example 1:

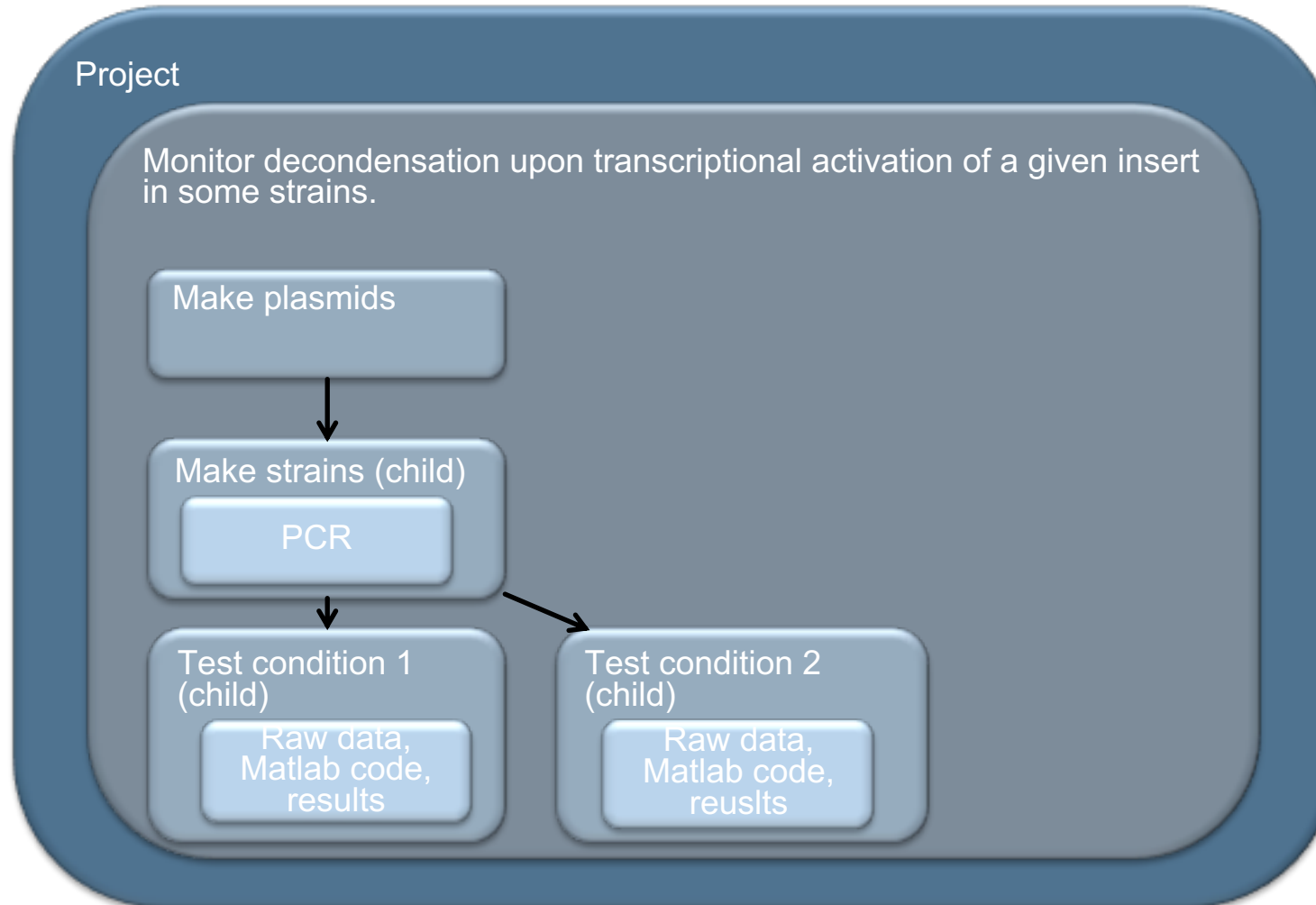
Monitor de-condensation upon transcriptional activation of a given insert in some strains.

This experiment involves 3 different steps:

1. Make some plasmids
2. Make reporter strains for de-condensation using plasmids made before—> PCR results
3. Test strains made before in different conditions -> raw data, MATLAB code

Each step depends on the previous one. It is possible to model this in openBIS by establishing connections between the steps.

openBIS data model for Example 1



Experiments and Experimental Steps

- Example 2:

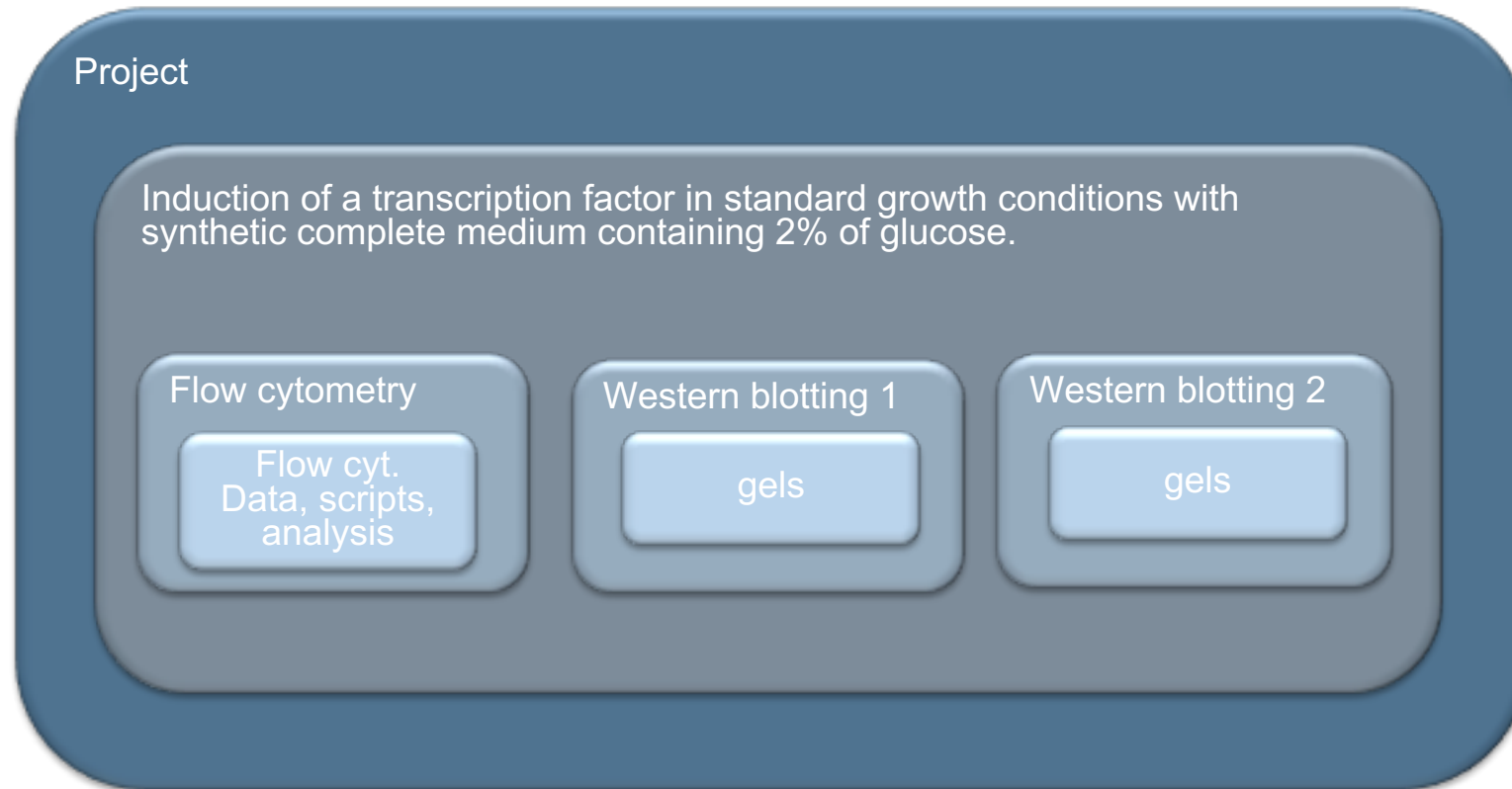
Induction of a transcription factor in standard growth conditions with synthetic complete medium containing 2% of glucose.

This experiment involves 3 different steps:

1. Detection of transcription factor induction by flow cytometry
2. Detection of transcription factor induction by Western blotting
3. Detection of transcription factor induction by Western blotting

Each step is independent of the previous one.

openBIS data model for Example 2



Overview of openBIS tutorial

Use-case example

Experimental yeast biology lab

- Lab that uses fission (*Schizosaccharomyces pombe*) and budding (*Saccharomyces cerevisiae*) yeast, as model systems with the aim to understand how a network performs its function in a cellular setting. They focus on the metabolism and effects on the physiological state of the cell.

| Examples of samples used | Examples of exp. techniques used |
|--------------------------|----------------------------------|
| Chemicals | PCR |
| Yeasts | Microscopy |
| Plasmids | Flow cytometry |
| Oligos | Western blotting |
| Enzymes | Etc... |
| Etc.. | |

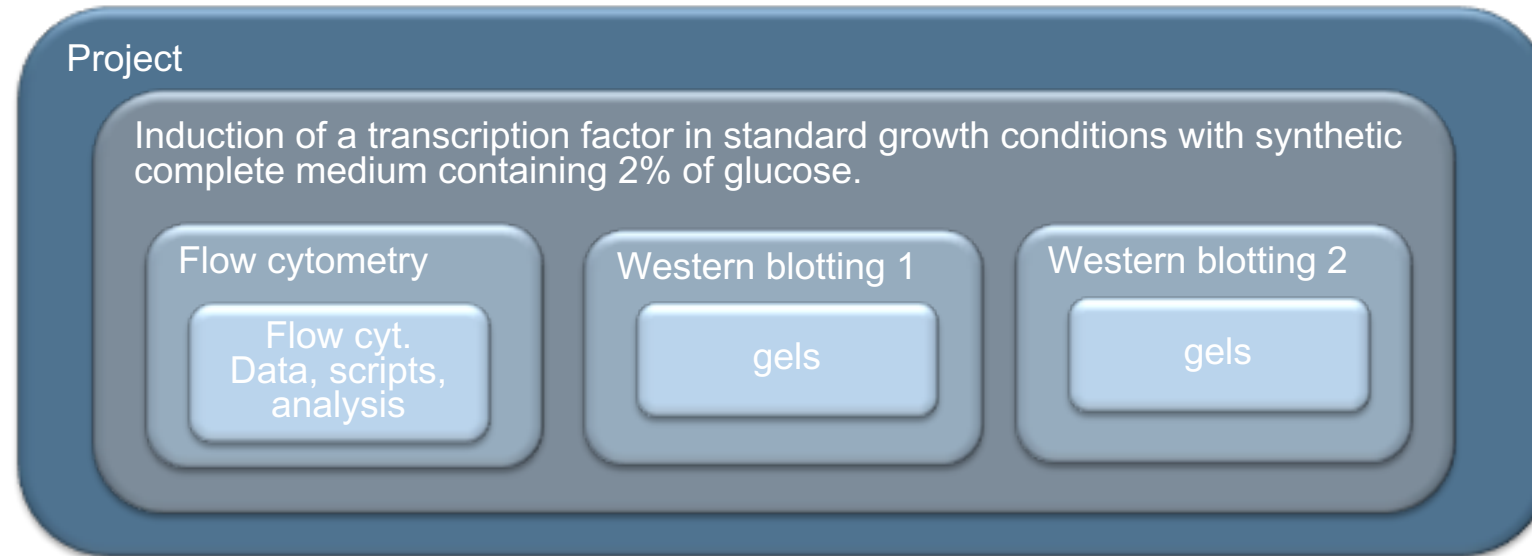
Management of samples and protocols

We will register a few samples and one protocol in the inventory, covering different topics:

1. Single sample registration
2. Batch registration of samples
3. Batch modification of samples
4. How to assign storage positions
5. How to establish relationships between samples
6. How to establish relationships between samples and protocols

Lab notebook

- In this tutorial, we will use Example 2 seen before:



- We will create **1 Project, 1 Experiment and 1 Flow Cytometry Experimental Step** in your personal space.
- We will see how we can **link** samples and protocols stored in the Inventory to the Experimental Step.
- We will **upload data** to the Experimental Step.

Go to tutorial
(p. 8-14)

Contacts & useful info

Documentation & video tutorials: <https://labnotebook.ch/>

SIS website: <https://sis.id.ethz.ch/>

Twitter: https://twitter.com/ETH_SIS

SIS helpdesk

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