



Data management at ESBATech

LabKey User Group Meeting 2015

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Group Head Screening Technology

ESBATech, a Novartis company

Overview ESBATech Pipeline

Therapeutic antibody discovery pipeline for Ophthalmology

scFv antibodies



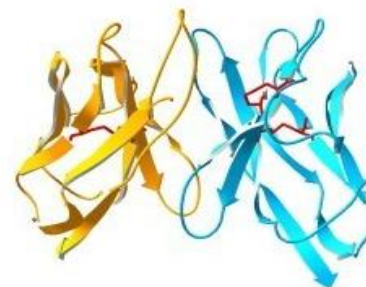
Process Development /
Production



PK/PD



Antibody Screening



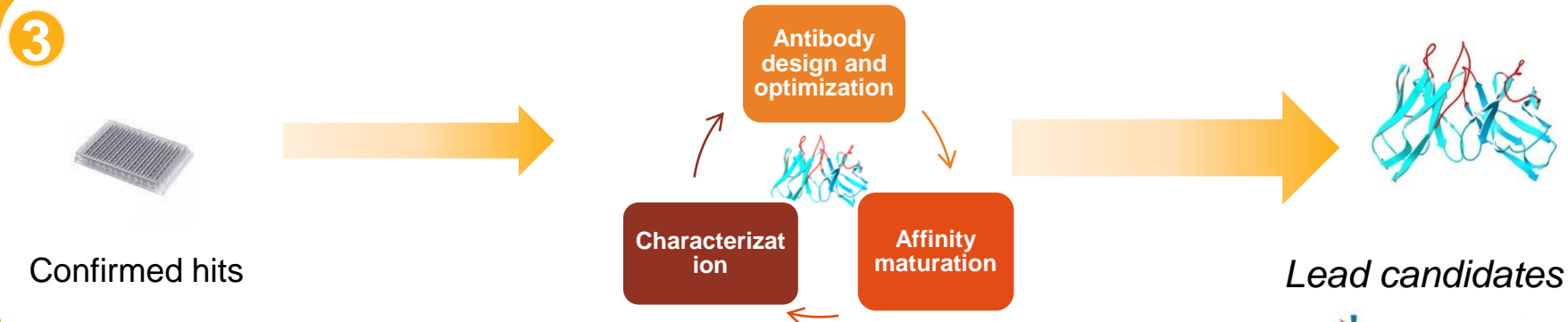
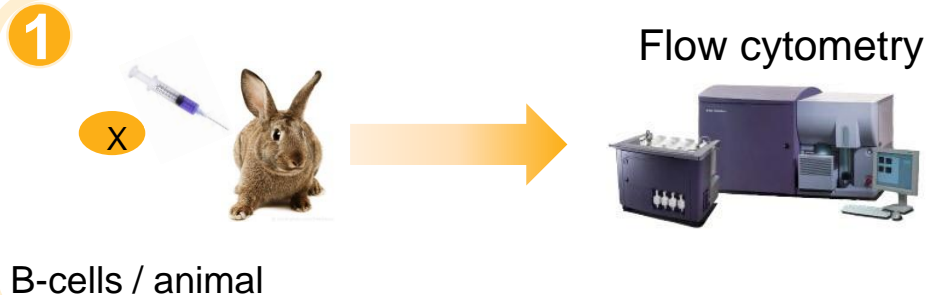
Protein Engineering



Formulation & Structural Biophysics

From Hit to Lead – Research & Development at ESBATech

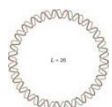
Antibody discovery and lead ID



ESBATech development & manufacturing

“Comprehensive technical development - in a Nutshell”

DNA



Discovery

Development

Manufacturing

Product



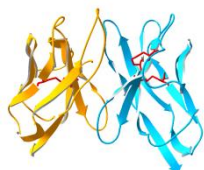
High throughput &
Standard production



Fermentation
& purification
development



GMP production
API & Product (Alcon)



Protein
Engineering



Assay
Development

DAS
Assessment



Formulation
development



Preclinic



Clinic

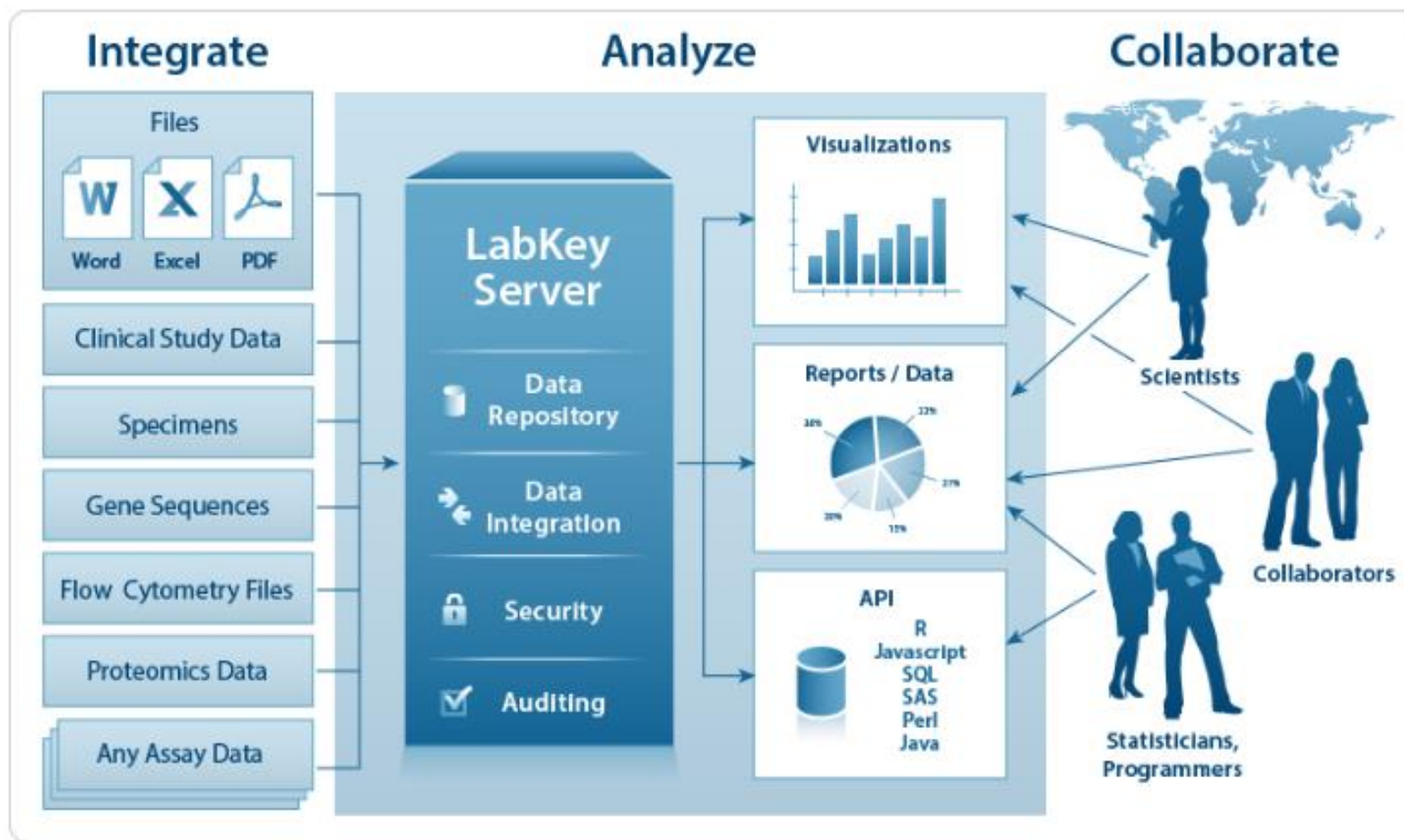
Requirements of a data management system

“What the system should do...”

- Capture result assay data securely at central place
- Get overview about which molecules are at what stage in the development pipeline
- Organize data via molecule identifier for queries across multiple projects
- Comprehensive searches for molecule properties
- Molecule/material storage inventory

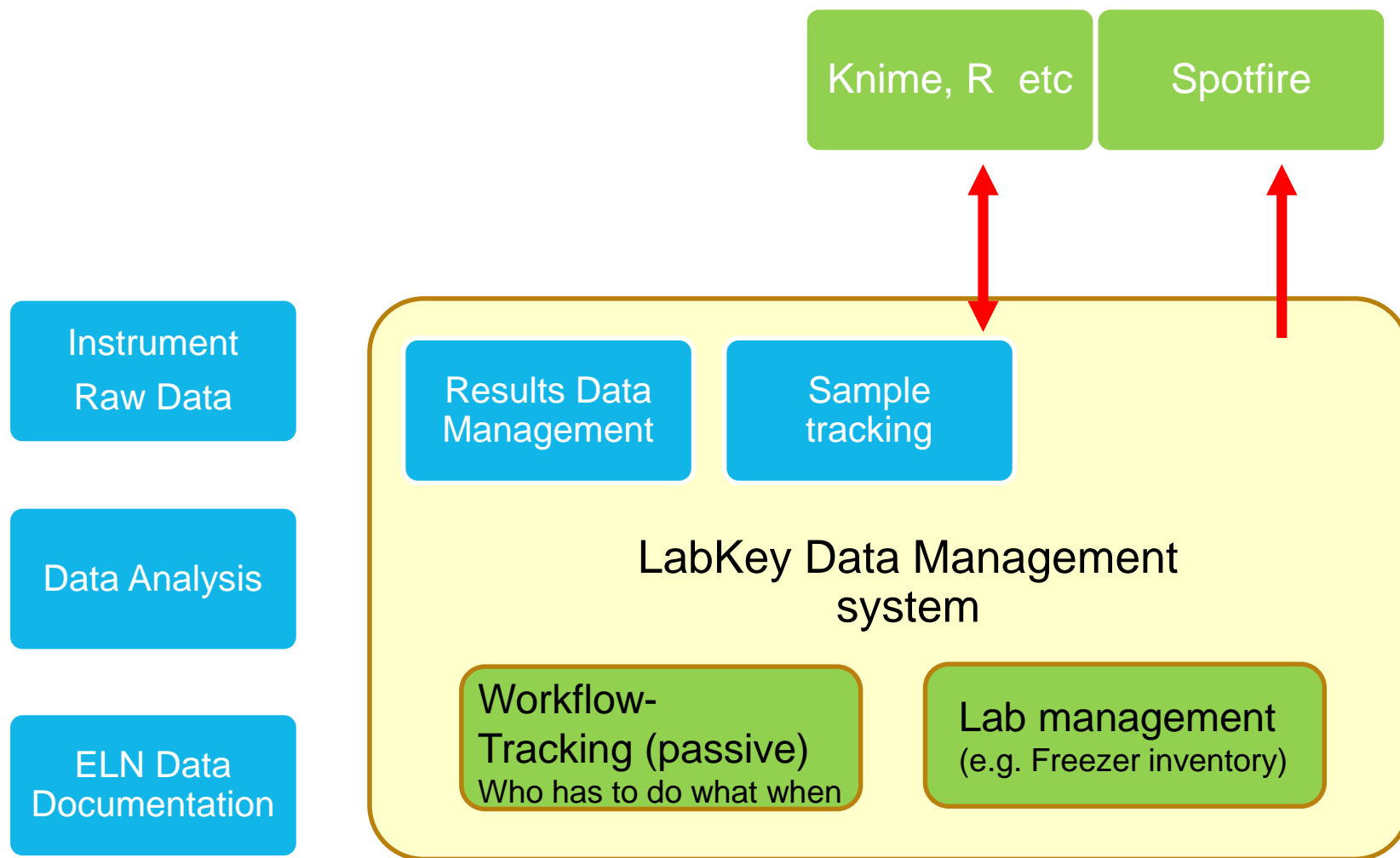
Data management solution

LabKey as hybrid open source solution / commercial solution



Requirements

“Data inside and outside of labkey”



Rabbit IgG Screening

Example of ELISA 384-well EC50 determination

Setup:

- 4708 candidates tested in dose response (12 conc.)
- Assay performed in 50 384 well plates
- Samples in duplicates
- Total 17600 sample wells (+ 1600 controls)

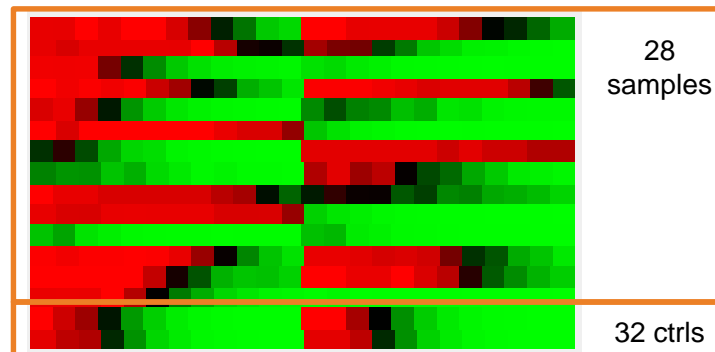
Analysis:

- Plate based normalization on based standard curves

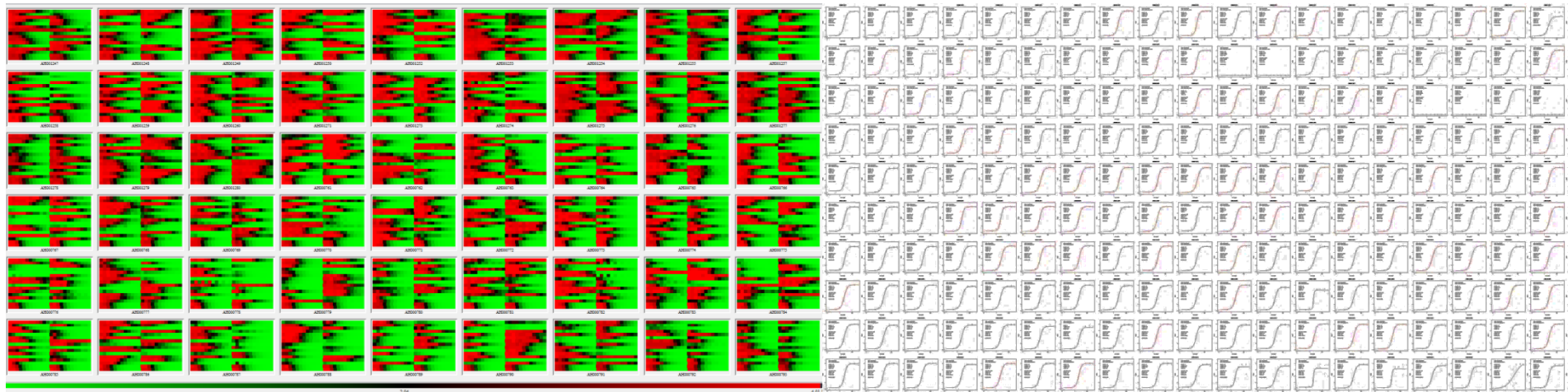
Hitselection:

- Hit candidates EC₅₀ determination, Hit rate ~ 50 %

Heatmap of raw OD₄₅₀



Automated data analysis

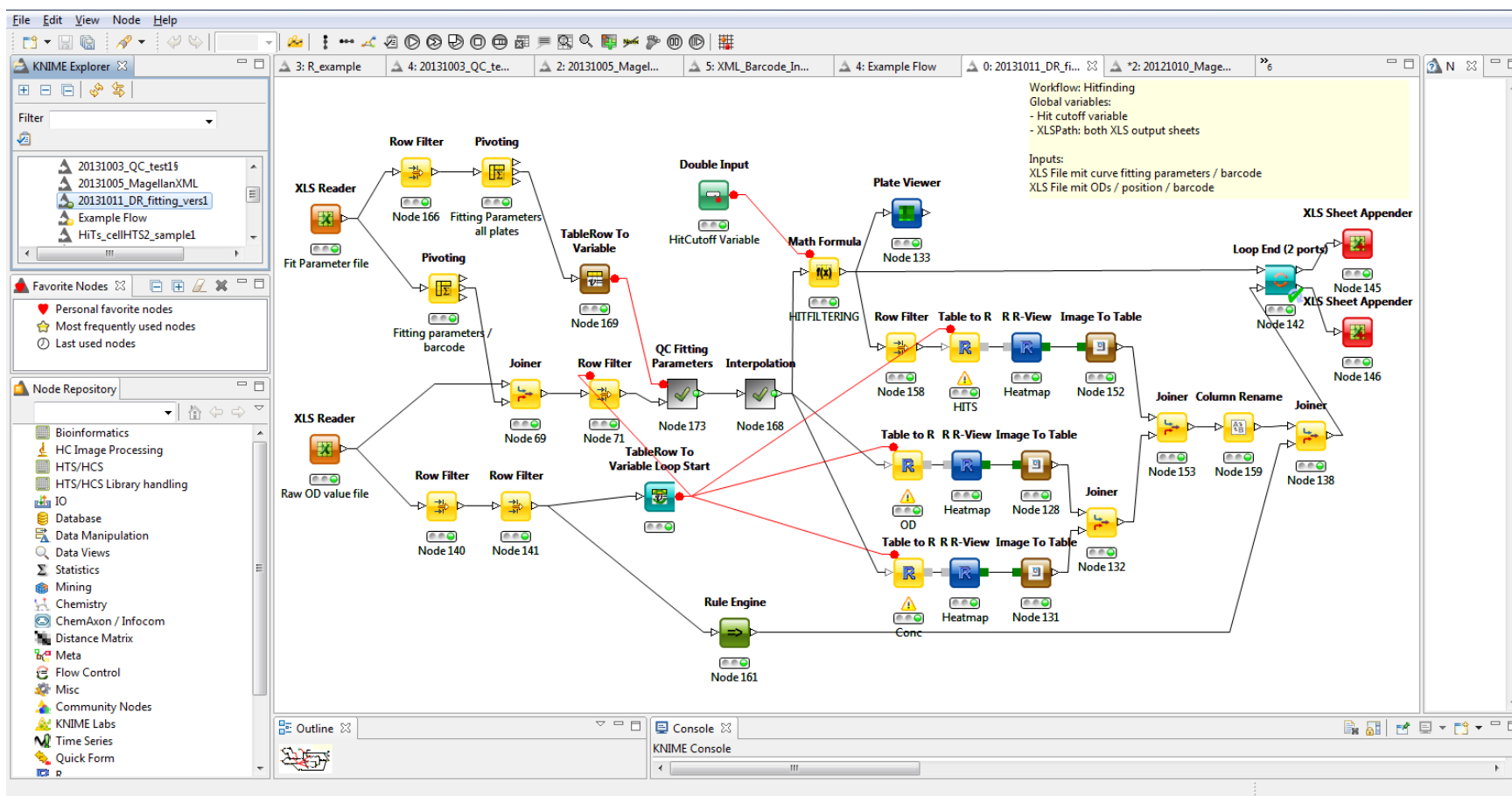


Automated Data Analysis Pipelines

Knime – Lego for biologists

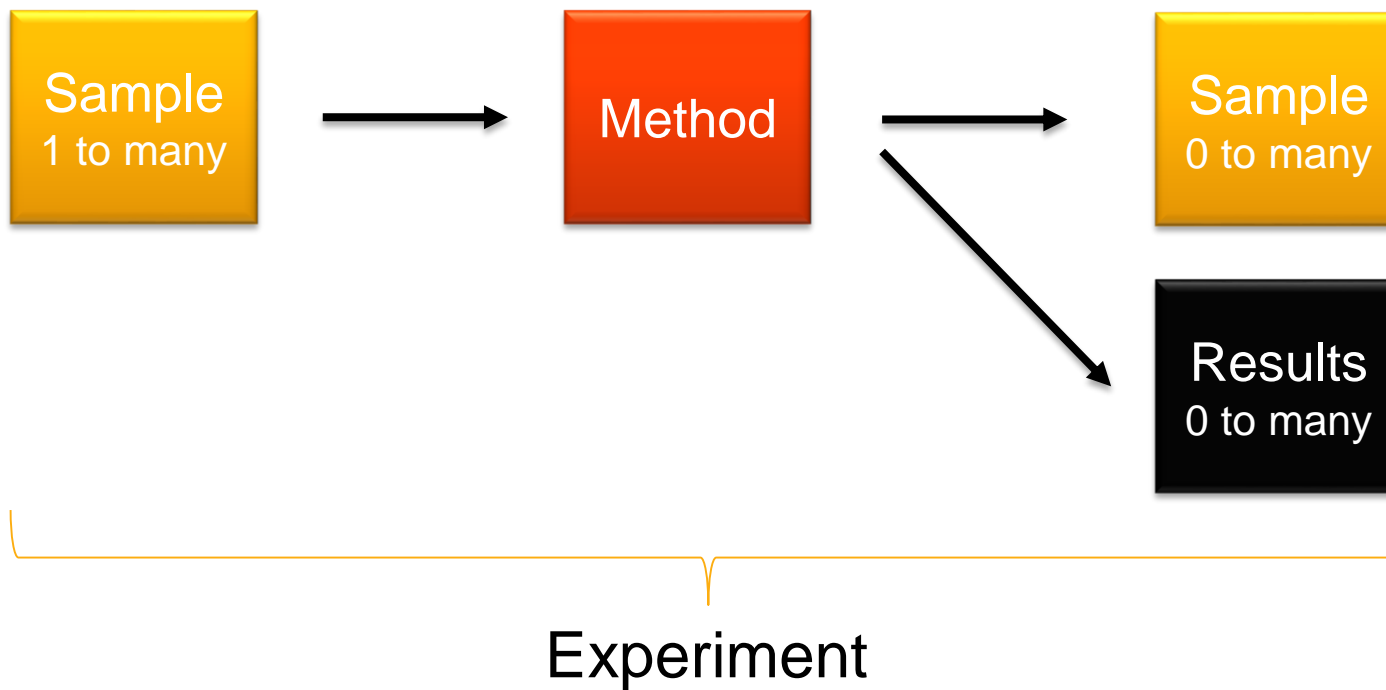


Data handling and conversion via Knime, statistics & curve fitting via R



Basic system operations

General principle:



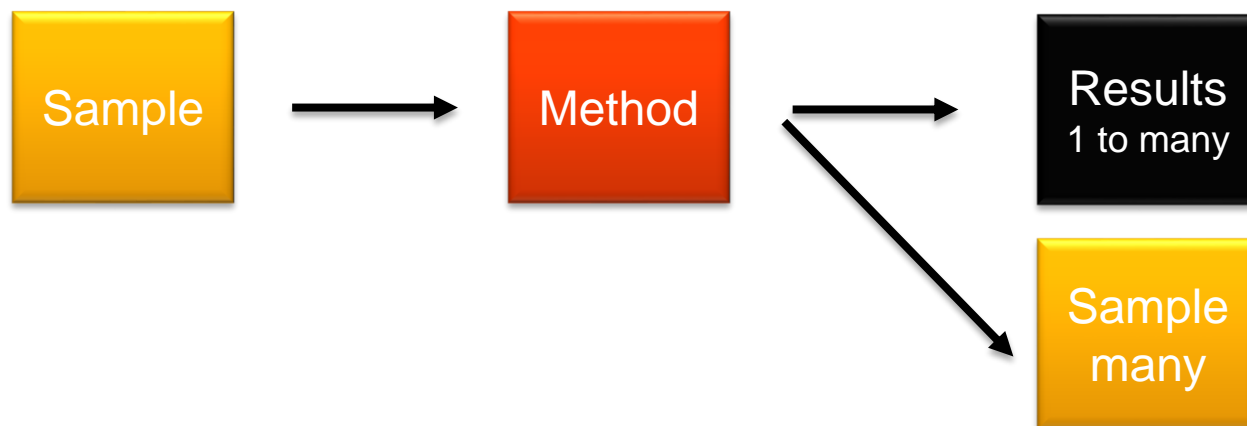
Basic system operations

Examples

Analytical assay:
(e.g. ELISA)



Assay in pipeline:
(e.g. HPLC)

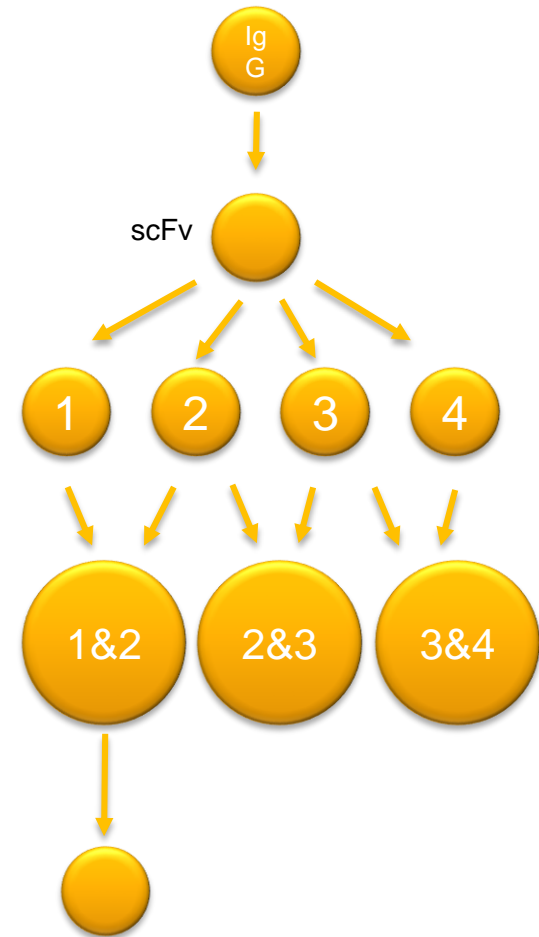
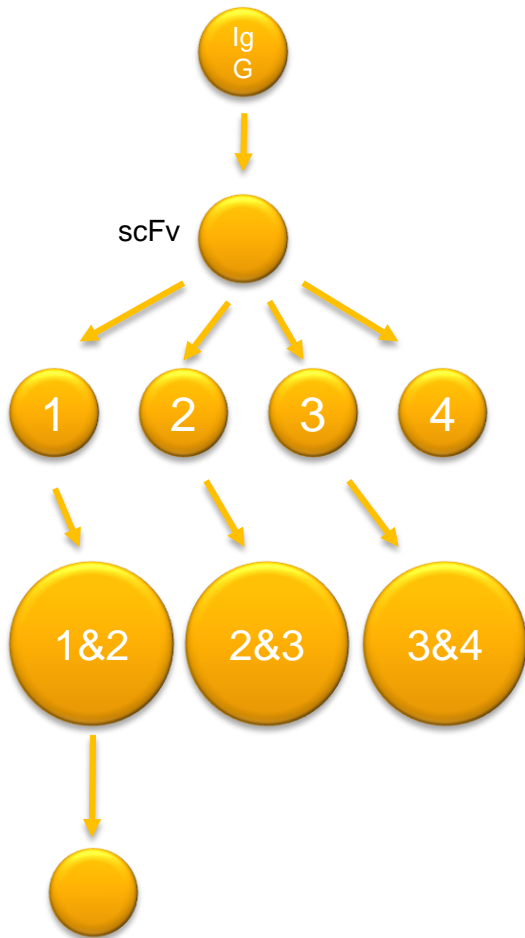


Aliquots:
(e.g. Storage of
biomolecules)

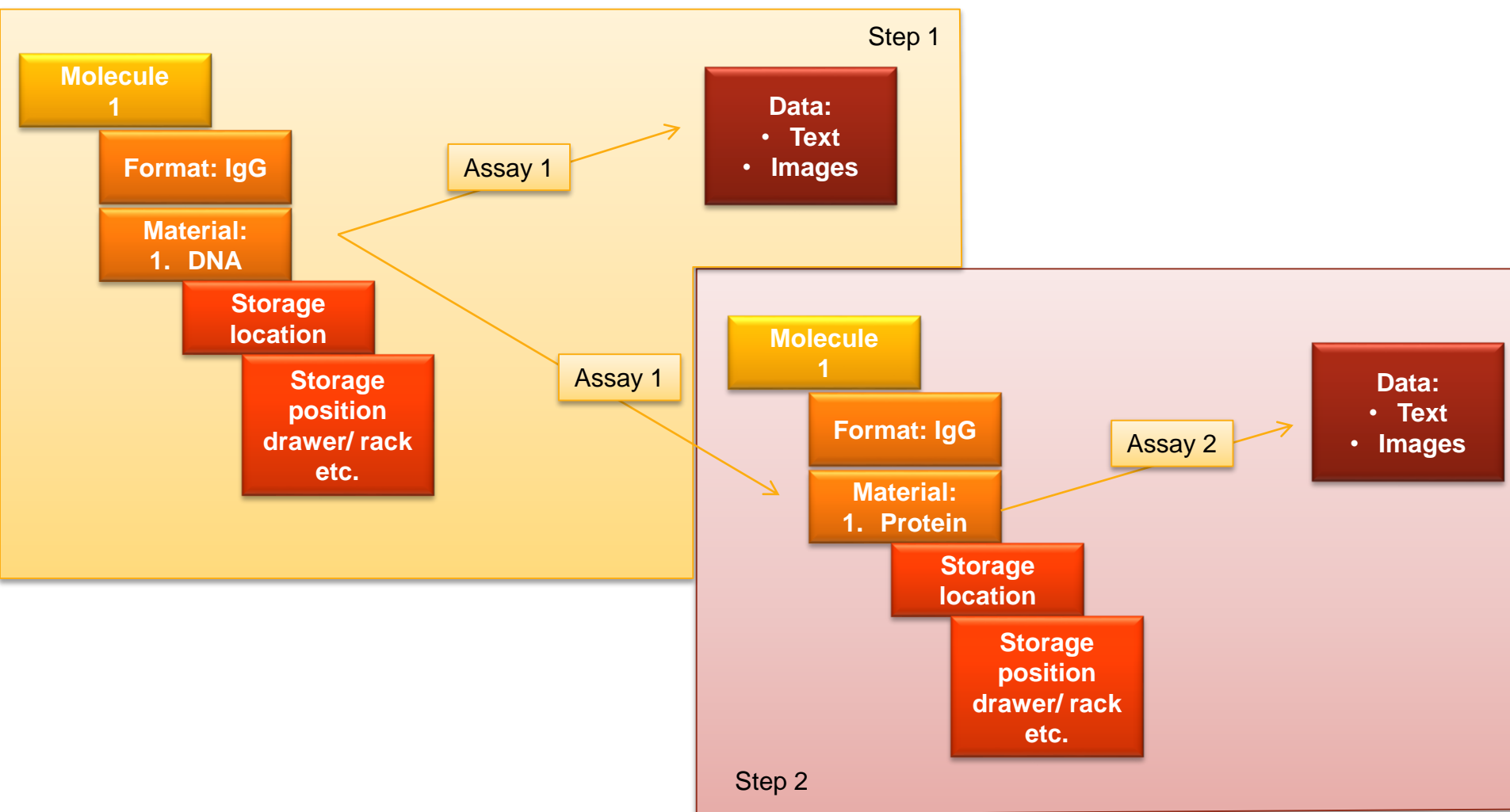


Molecule hierarchy

One to many vs many to one in addition

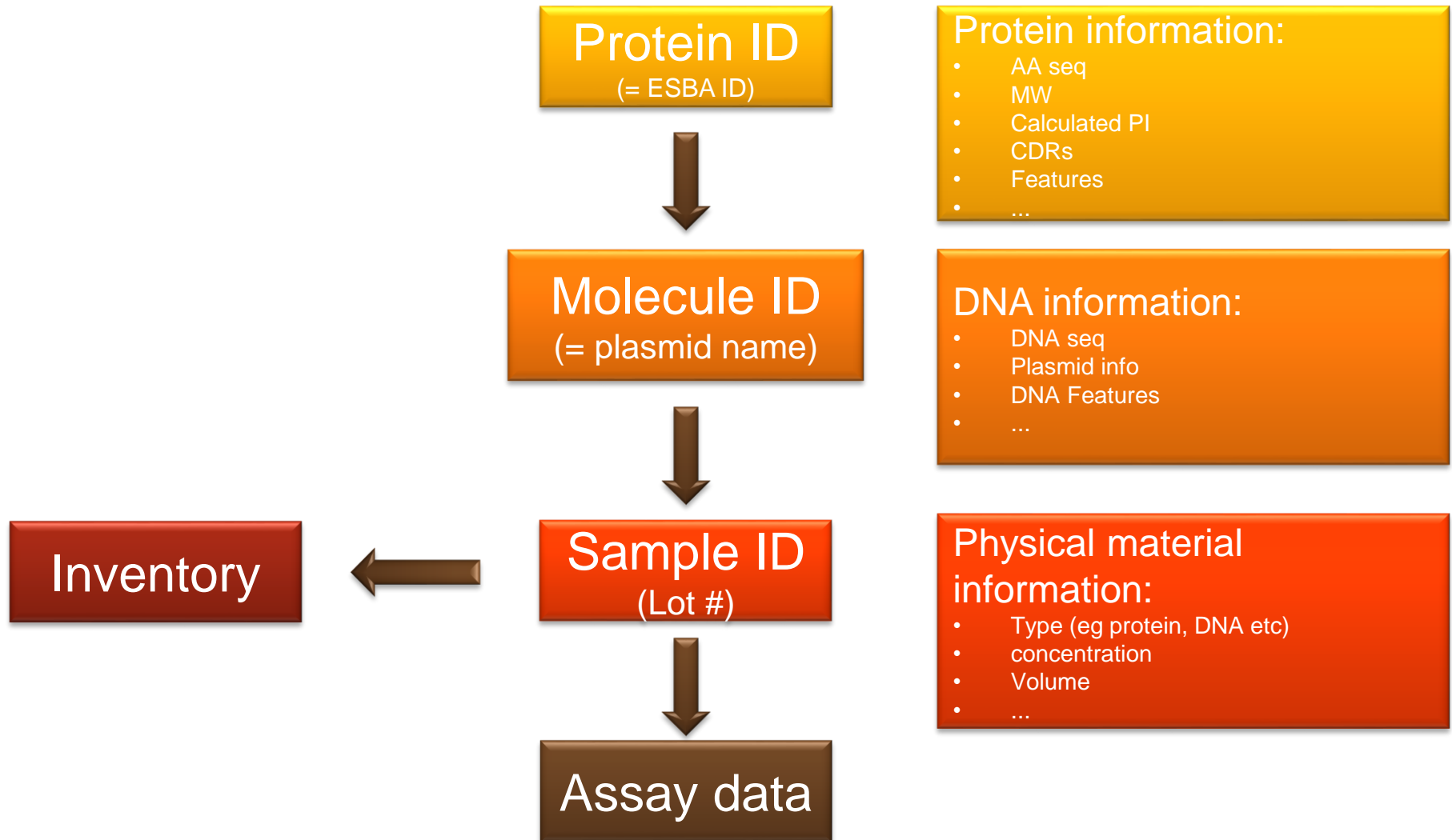


Same molecule, multiple materials, multiple assays



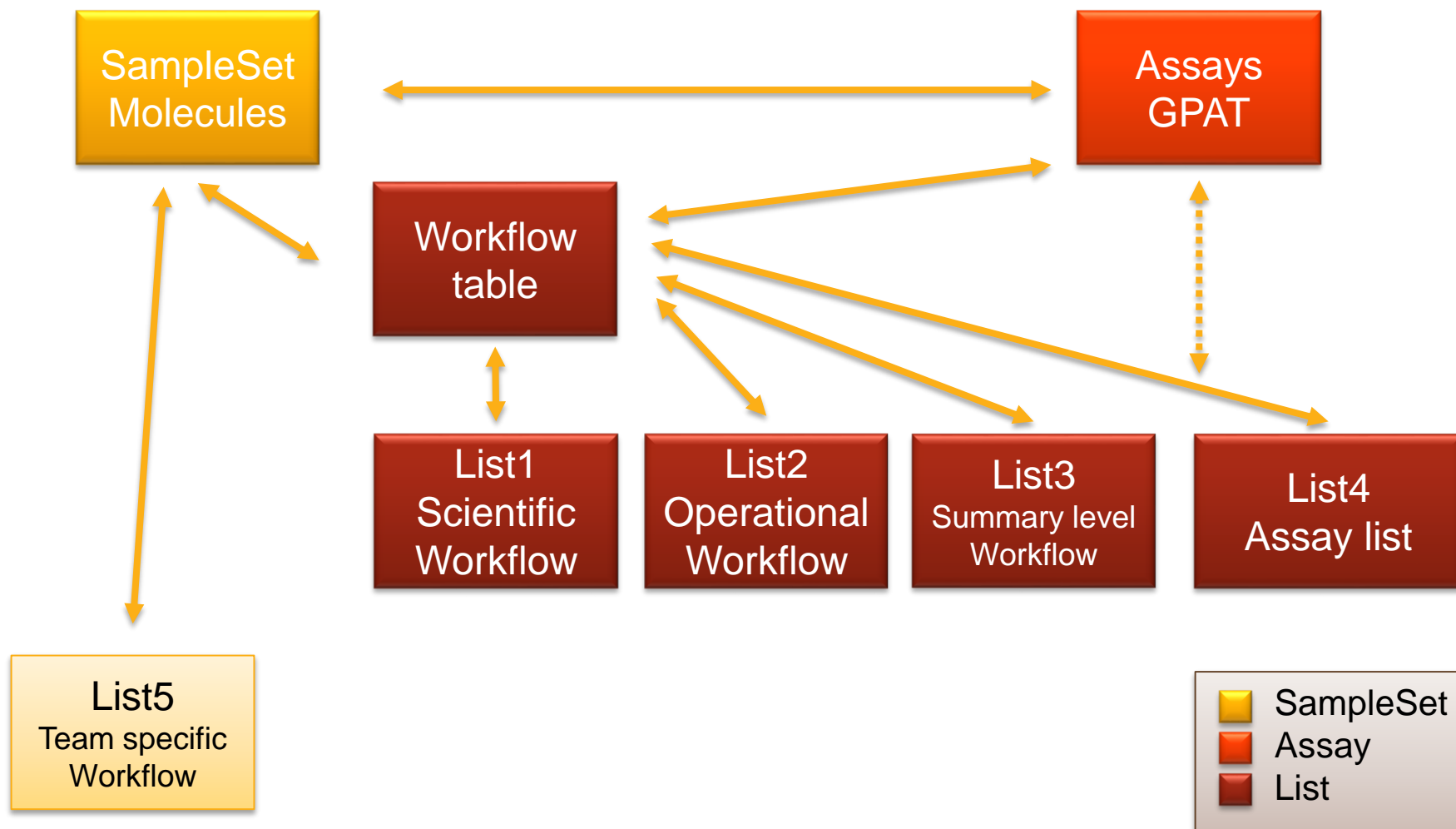
General hierarchy structure

«It's all about proteins.»



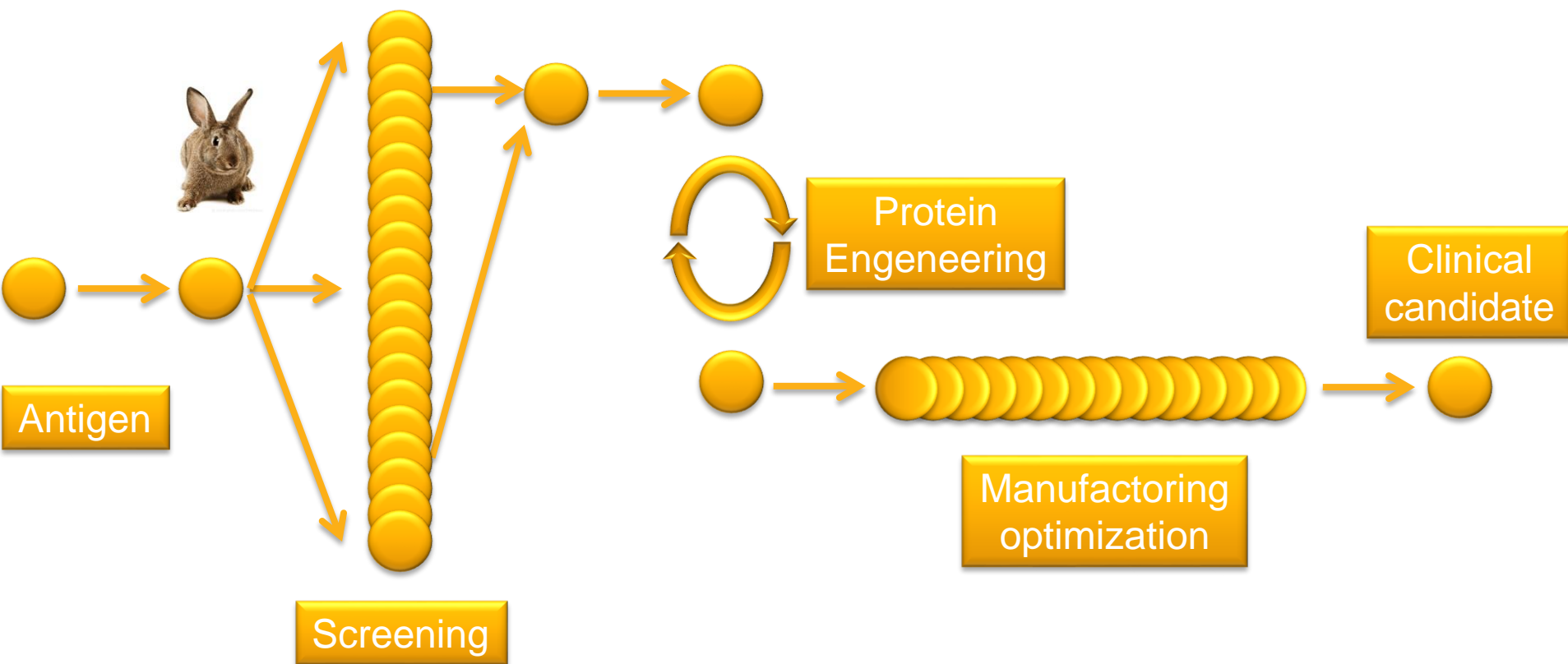
Workflow tracking

Passive tracking of materials and assays across departments



ESBATech drug development process

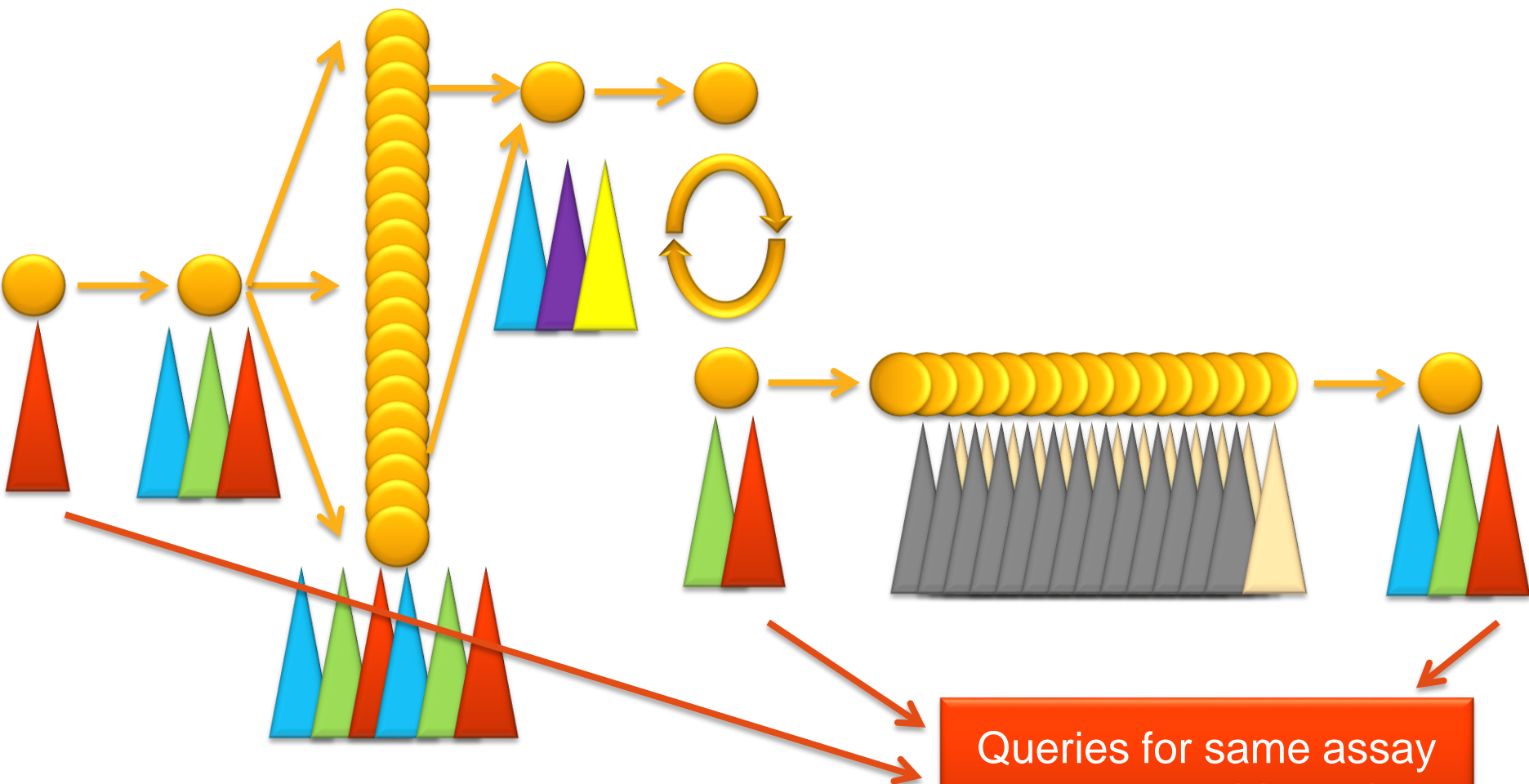
Molecule hierarchy



Arrows: Change in molecule properties

ESBATech drug development process

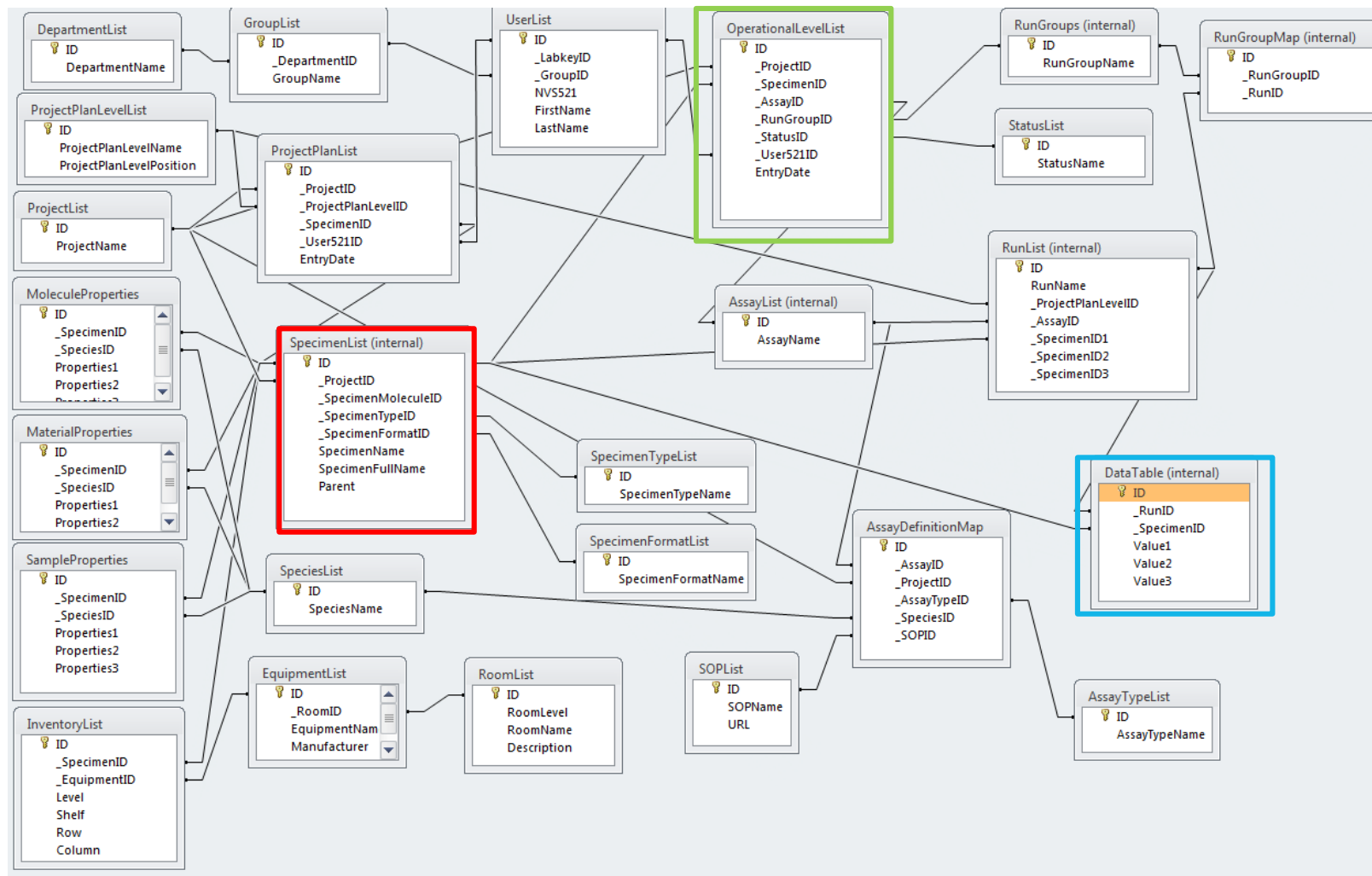
Molecule hierarchy <-> assay hierarchy



Arrows: Change in molecule properties
Triangles: Associated assay data

LabKey

Data model



LabKey example – Department specific requirements

Molecule / workflow management

OPH CHSC DMS Development

Admin ▾ Help ▾ Stefan Moese ▾

ESBAtchPilot1 Starting Page Rnd **Production** Projects Admin Stefan Oli

Main portal for Production Group ▾

Workflowstep HTP ▾

QUERY ▾ VIEWS ▾ CHARTS ▾ INSERT NEW IMPORT DATA DELETE EXPORT ▾ PRINT PAGE SIZE ▾ VIEW DESIGN DELETE ALL ROWS

View: Workflowstep_HTSP

<input type="checkbox"/>			Workflow level 1 Generic Project Plan	Workflow level 2 Operational Step	Operation Level 2 Status	User	Date
<input type="checkbox"/>	EDIT ▸	DETAILS ▸	5. Characterisation IgG SN	HTSP	open	Stefan Moese	10.03.2015

Workflowstep Standard Production ▾

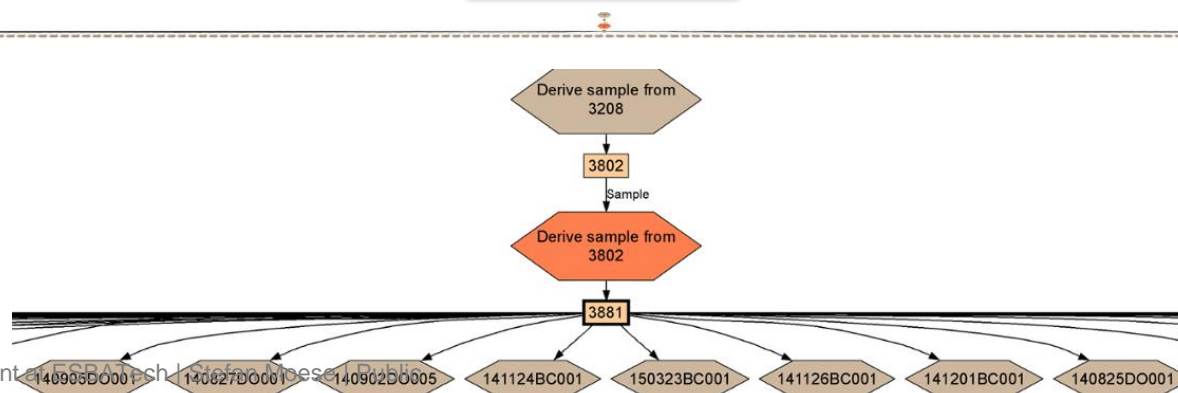
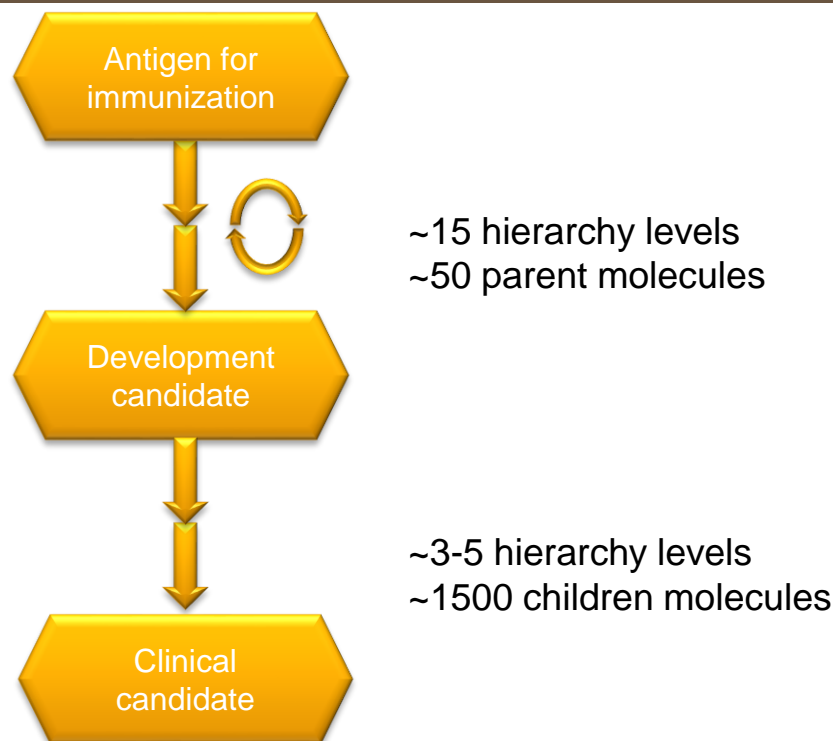
QUERY ▾ VIEWS ▾ CHARTS ▾ INSERT NEW IMPORT DATA DELETE EXPORT ▾ PRINT PAGE SIZE ▾ VIEW DESIGN DELETE ALL ROWS

View: Workflowstep_standardproduction

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<input type="checkbox"/>	EDIT ▸	DETAILS ▸		Standard Production		Stefan Moese	01.04.2015	6002

LabKey example molecule hierarchy implementation

Example: molecule hierarchy of a development candidate

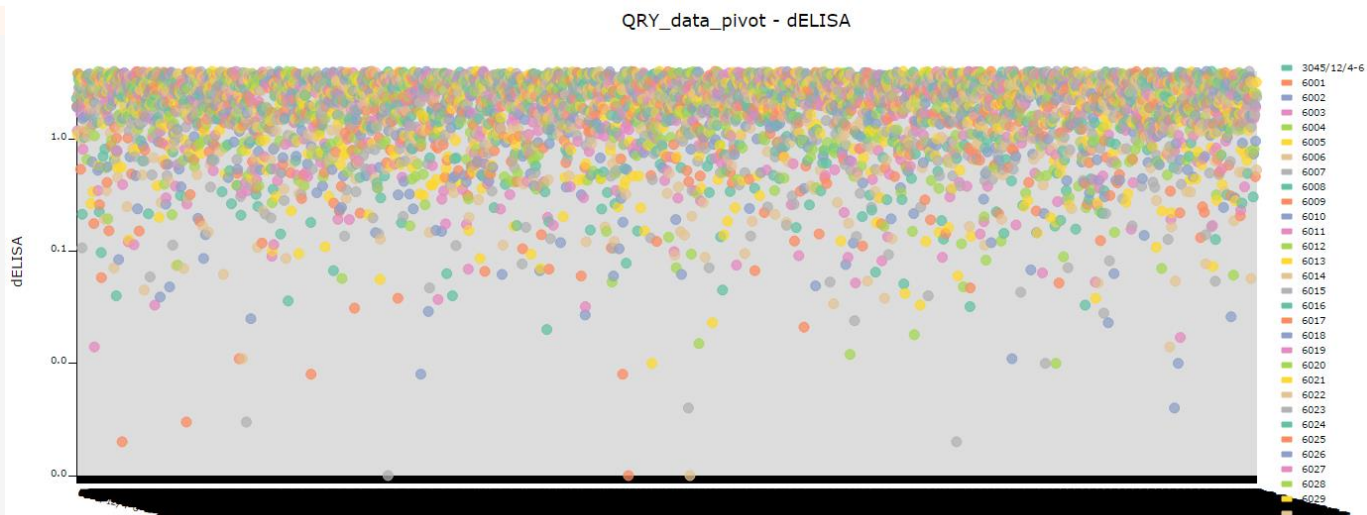


LabKey example assay implementation

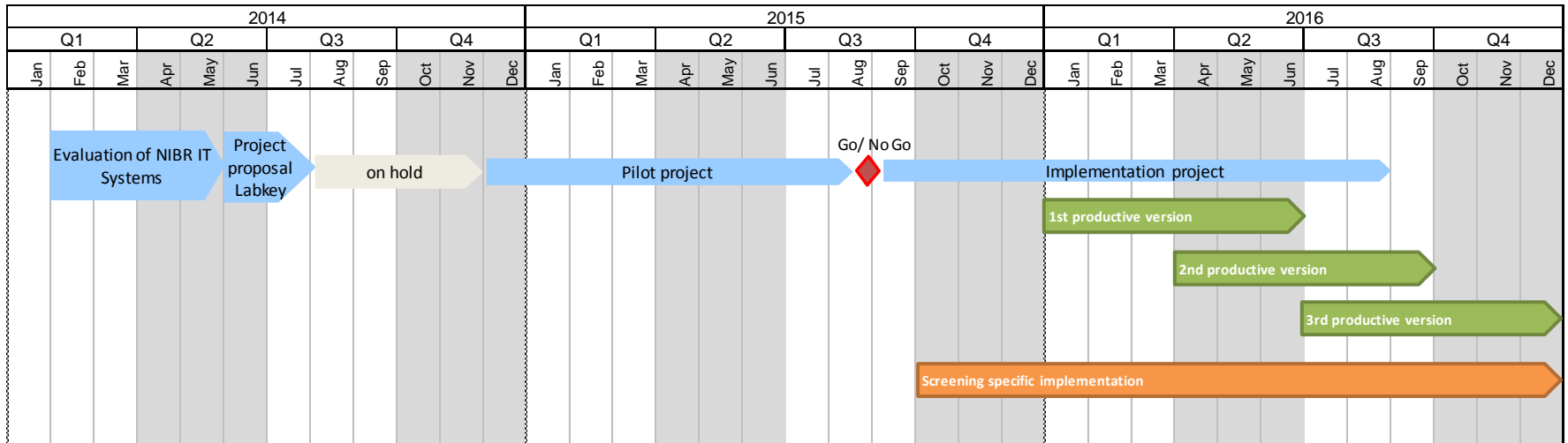
Assay List ▾

VIEWS ▾ NEW ASSAY DESIGN MANAGE ASSAYS 1 - 58 of 58

Name ▴	Description	Type
ADAconfirmatory		General
ADA-dELISAconf		General
ADA-dELISAscreening		General
ADA-ELISAscreening		General
Biopanning		General
cELISA		General
Cell_banking_USP		General
Cell_disruption		General
cell-basedPotencyAssay		General
CE-SDS		General
Chromatography_DSP		General
Chromatography_STD		General
cIEF		General
Conditioning_DSP		General
dELISA-DR		General
dELISAPhage		General
DLS		General
DLS_FOR		General
DSC		General
Endotox_DSP		General
EquilibriumUnfolding		General
EukaryoticExpression		General
Expression_Solubilization_HTP		General
Expression_STD		General
Fermentation		General
Filtration_DSP		General
Finalization_STD		General
Formulation		General
FTIR		General
hcP_DSP		General
HiChydrophobicity		General
HPLC		General
IB_aliquotation		General
IEX_DSP		General
MALS		General
MS_DSP		General
OD350_FOR		General
PAGE_DSP		General
PAGE_FOR		General
Pooling_DSP		General
Primary_Recovery		General
PurificationEukaryoticExpression		General
qELISA		General
Refolding_DSP		General
Refolding_STD		General
RF_Purification_HTP		General
SDS-PAGE-RnD		General
SE_HPLC_USP		General
SEC_DSP		General
SE-HPLC-RnD		General
Solubilization_DSP		General
Solubilization_STD		General
SPRcapture		General
SPRdirect		General
Stress		General
SubVis_DSP		General
Thermofluor		General
UVconc		General



Project planning data management and next steps



- Pilot project version 4 running
- Assay setups established
- Test dataset defined
- Server performance / infrastructure testing and optimization *ongoing*
- Test dataset integration *ongoing*

Business logic



Usability

Acknowledgments



Olivier Mauti
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Matthew Bellew
Josh Eckels
Ryan Luce
Patty Foley
Molly O'Hara
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