OGI-IT (L)IMS

an overview

IMS-Information Management System

- **Information** is stored in databases (DB) - we use document oriented DB so that the DB Model (collections of documents) can match as close as possible the real world document model. This is in contrast to a relational model where the real world model is decomposed in a more complex relational one (many tables and relations)

- Information is transformed (sorted, queried, aggregated) so that **Management** decisions can be made

- A web based front end (web app), generated by the data model description (schema), enables the use on different computer **Systems** like desktops, tablets or even smartphones

LIMS - Laboratory IMS

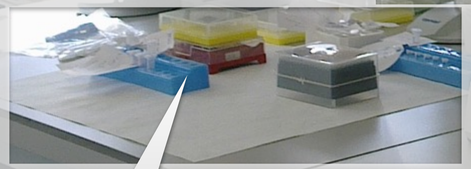
first IMS implementation was for a chemical analytical **Laboratory**
some lab documents (collections) are:

- Studies (Studien)
- Samples (Studienproben)
- Operating Procedures (Laborvorschriften)
- Batches (Laborarbeiten)
- Equipment (Laborgeräte)
- External Materials (externe Materialien) i.e. chemicals, pure substances, matrices, etc.

Laboratory ?

External Materials
(externe Materialien)

Equipment
(Laborgeräte)



Derived Products
(Laborprodukte)

Samples
(Studienproben)

working on a „Batch“

derived products (Laborprodukte) = samples (Studienproben) +

derived products (Laborprodukte) +

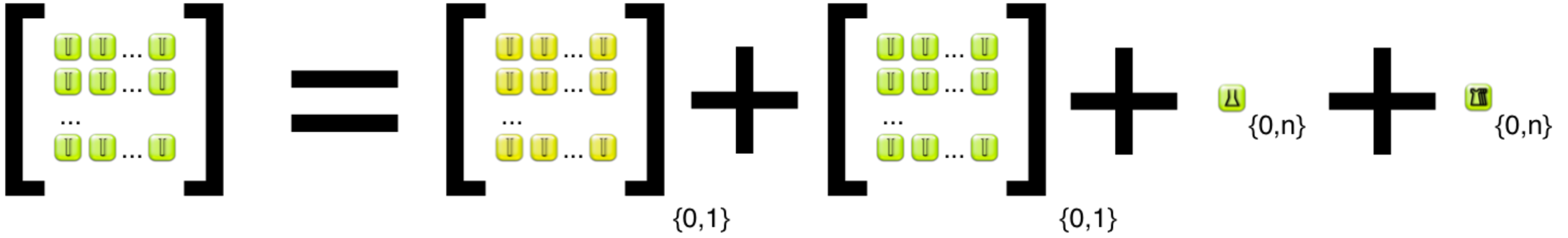
equipment (Laborgeräte) +

external material (externe Materialien)

Legend (Legende)

- Batches (Laborarbeiten)
- Samples (Studienproben)
- Equipment (Laborgeräte)
  i.e. pipettes, scales, HLPC, etc.
- External materials (externe Materialien)
  i.e. chemicals, pure substances, matrices, etc.
- Derived products (Laborprodukte)
  i.e. injection samples, standards, etc.

- a batch is the execution of a SOP (standard operating procedure)



LIMS features 1/2

- Standard Operating Procedures (SOP) are phrased step by step using generic placeholders for the equipment, probes and chemicals used
- Derived products of the execution of such a SOP, have calculated properties based on generic formulas defined in the SOP
- Laboratory work like sample preparation, standards production etc. can be predefined by SOPs (Laborvorschriften, Laboraufträge)
- and the execution documented (Laborarbeit)
- derived products (injection samples, standards, etc.) from laboratory work are then generated into the LIMS having all the needed properties (concentration, dilution, etc.) by the touch of a button

LIMS features 2/2

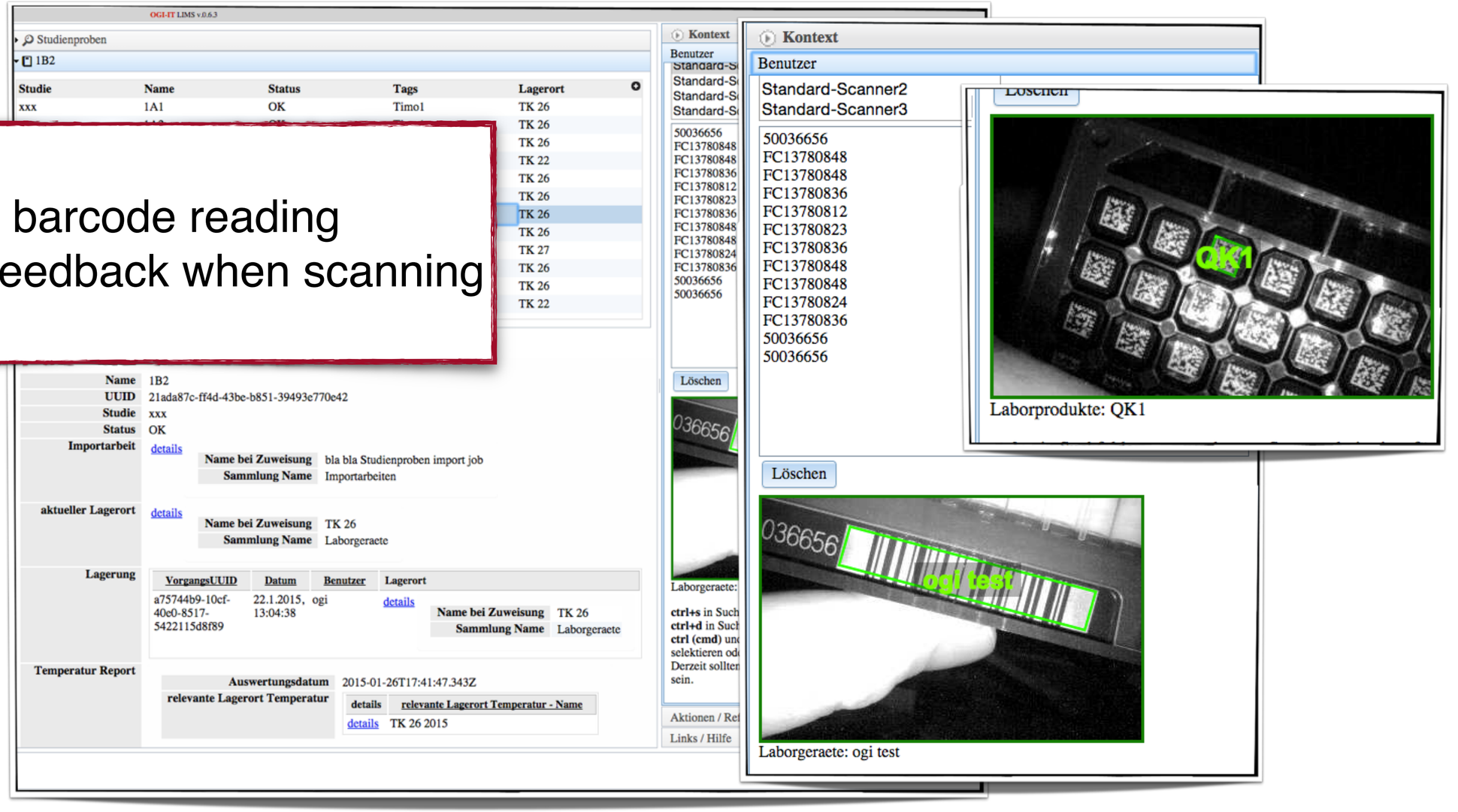
special lab hardware connected to the LIMS

- a Companion App to the SCIEX Analyst Software for LC/MS/MS (Liquid chromatography–mass spectrometry/ mass spectrometry) equipment
- template based network label printer (brother)
- optical barcode-scanner (1D, 2D) with optical feedback (cognex)

Visual Feedback

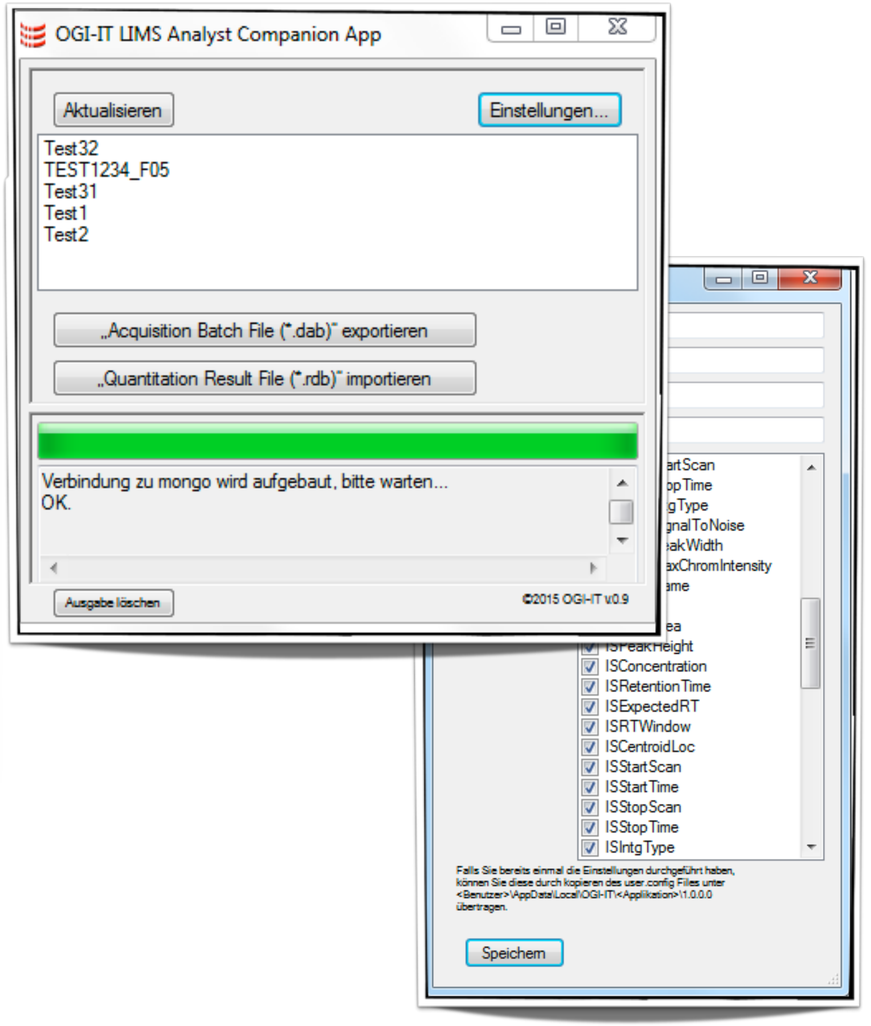
image-based barcode reading

- get visual feedback when scanning



Analyst Companion App

The OGI-IT LIMS Companion App is started inside of the SCIEX Analyst Software , a widely used LC/MS/MS (Liquid chromatography–mass spectrometry/ mass spectrometry) instrument control software. It allows both import of „Acquisition Batches“ from the LIMS and export of „Quantitation Results“ back into the LIMS.



IMS features 1/2

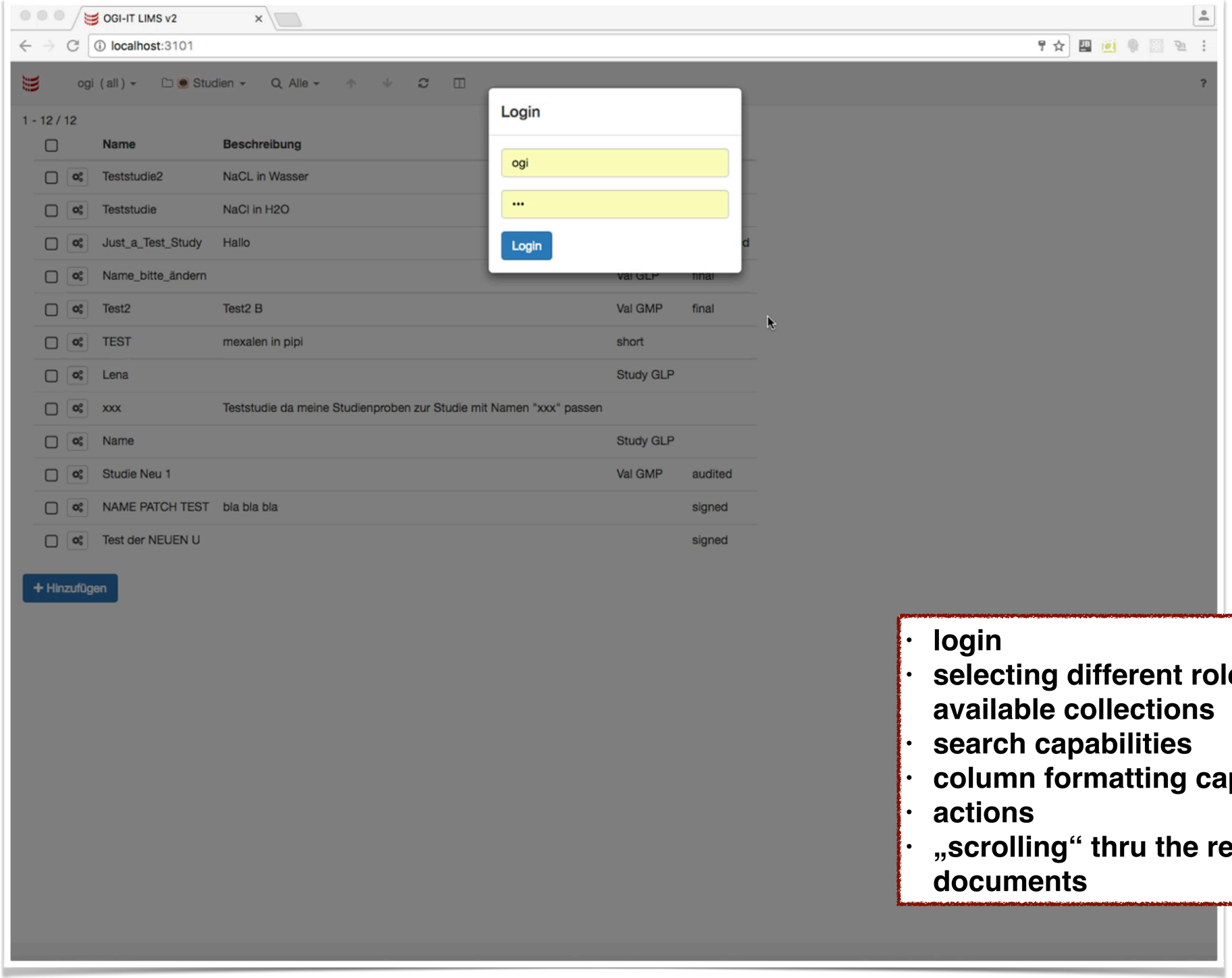
- documents are grouped into collections based on their type (schema)
- documents in collections may have different types (schemas) when document requirements change over time
- role based document access (user may have multiple roles assigned)
- every collections may have different actions defined, which also depend on the users role and document content
- sign action - used to advance the state of a document in the document workflow, show document changes during this workflow and based on the role and content of the document
- after first signing, deleted documents are moved into the „archived documents“ collection

IMS features 2/2

- document import (csv, json) based on import jobs (documented import)
- document export (json)
- reporting (web, pdf, csv)

(L)IMS web app

roles, collections, queries, documents



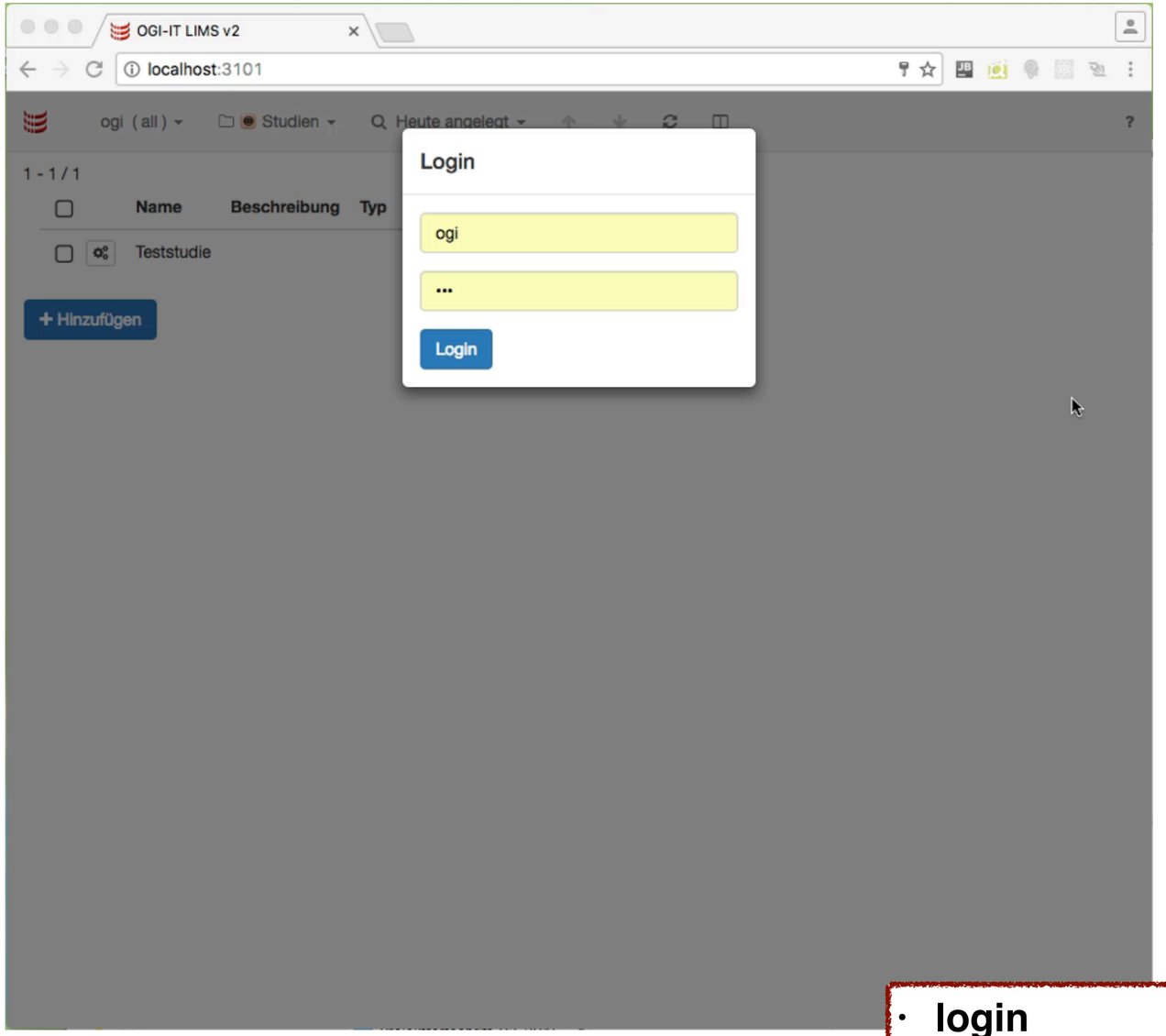
- **login**
- **selecting different roles changes the available collections**
- **search capabilities**
- **column formatting capabilities**
- **actions**
- **„scrolling“ thru the result set of documents**

Technologies

- mongodb - document oriented nosql database
- JSON Schema - definition and verification of documents structure, including definition of visual representation
- nodejs - event-driven, asynchronous, cross-platform, runtime environment, programmed mainly in javascript and optimized for real-time web applications
- react, redux, sagas - front end framework for web applications

example of a document

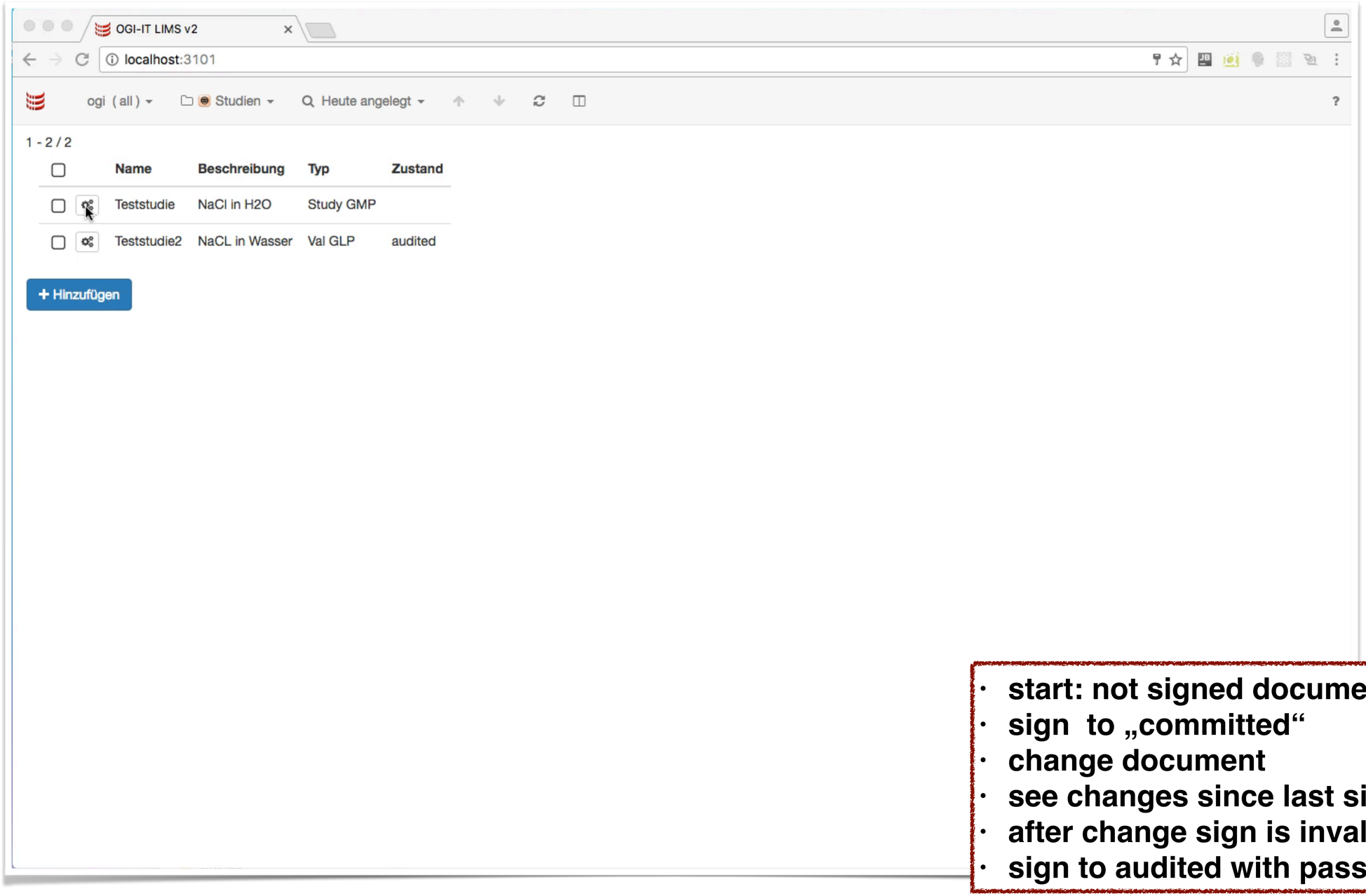
Study (Studie)



- login
- add new study
- enter data into a („complex“) document
- view document

document „workflow“

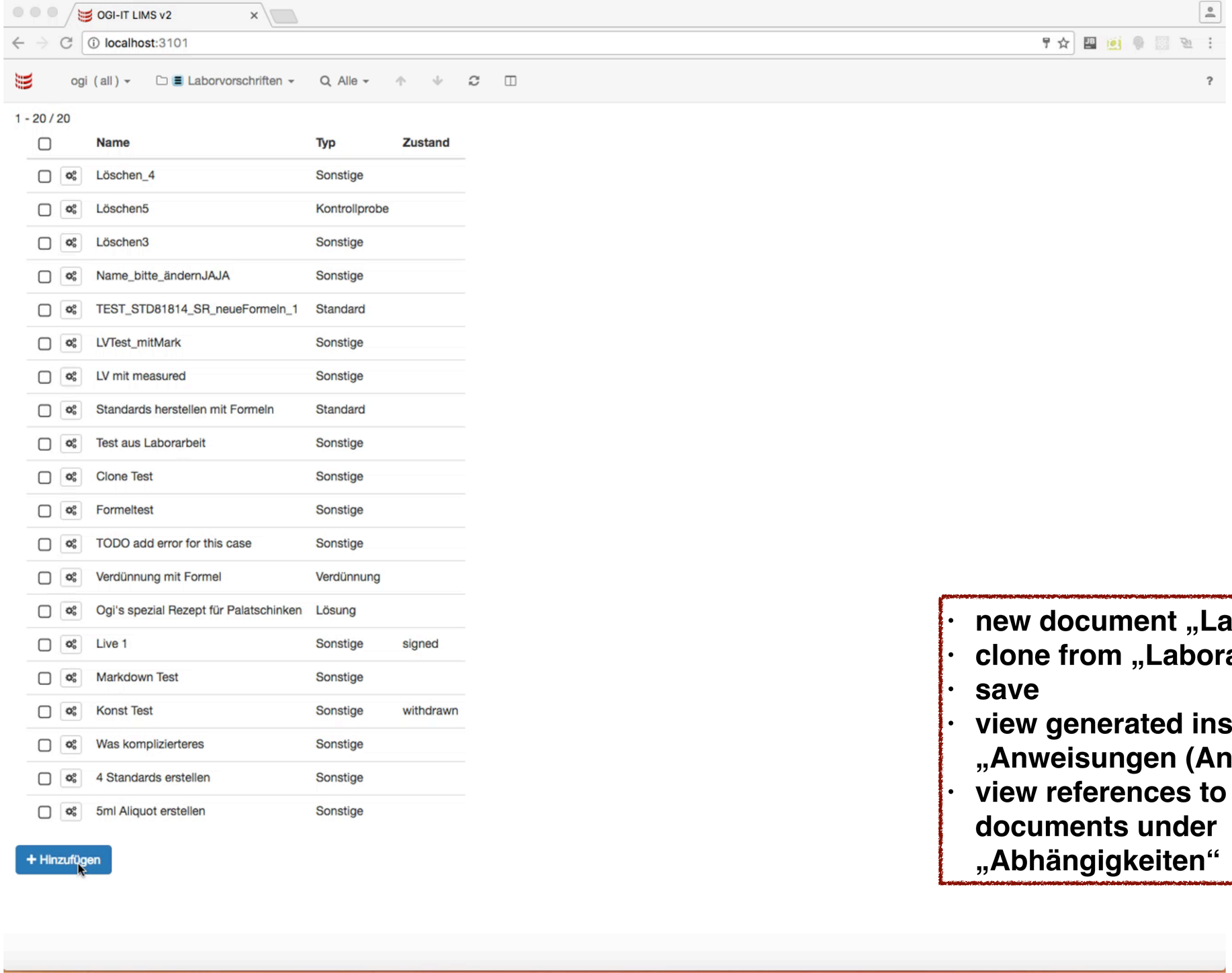
sign (unterschreiben)



- start: not signed document
- sign to „committed“
- change document
- see changes since last sign
- after change sign is invalid
- sign to audited with password

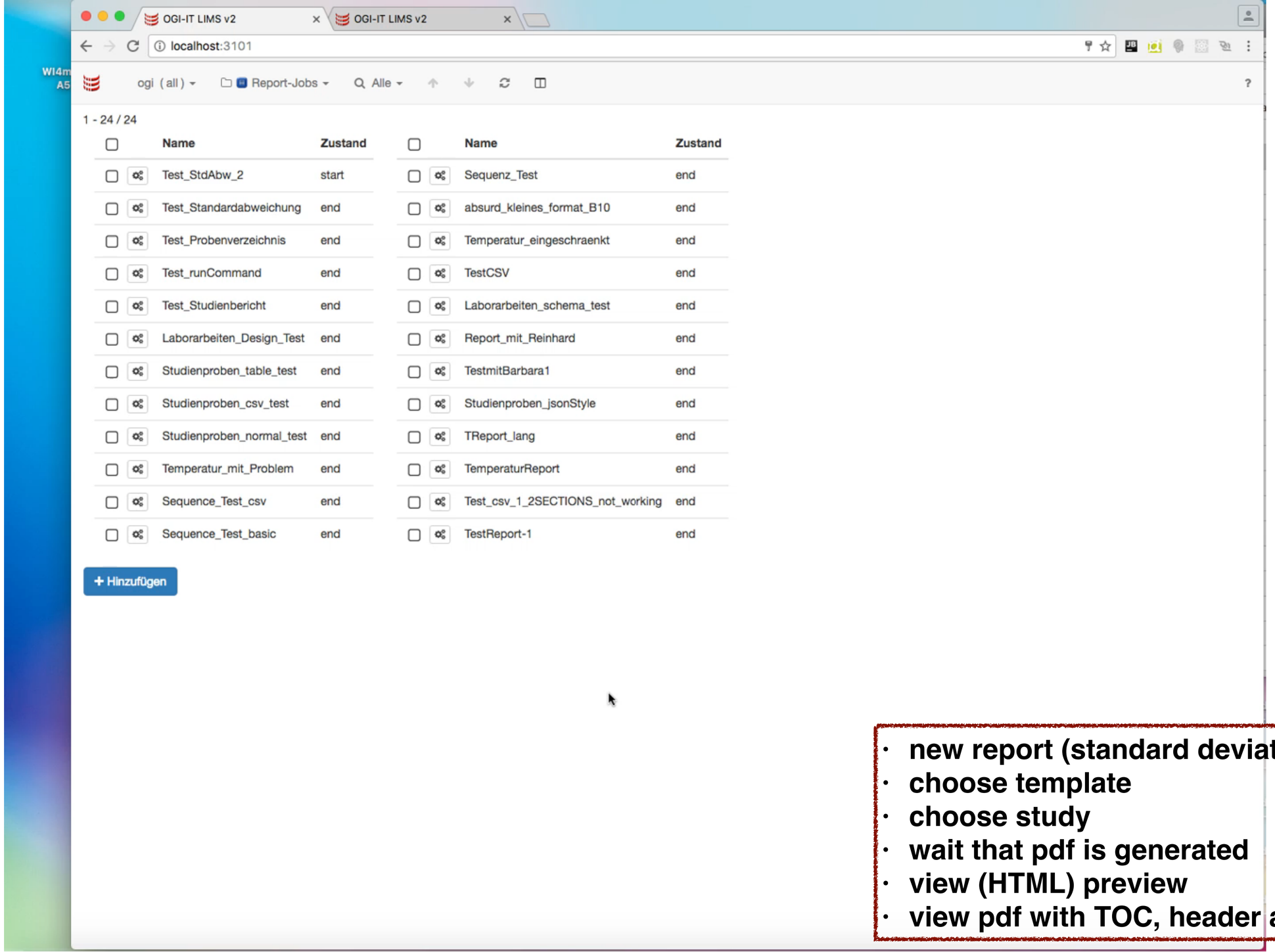
References

documents with references to other documents
or populating some fields with data from another document („cloning“)



- new document „Laborvorschrift“
- clone from „Laborarbeit“
- save
- view generated instructions „Anweisungen (Ansicht)“
- view references to other documents under „Abhängigkeiten“

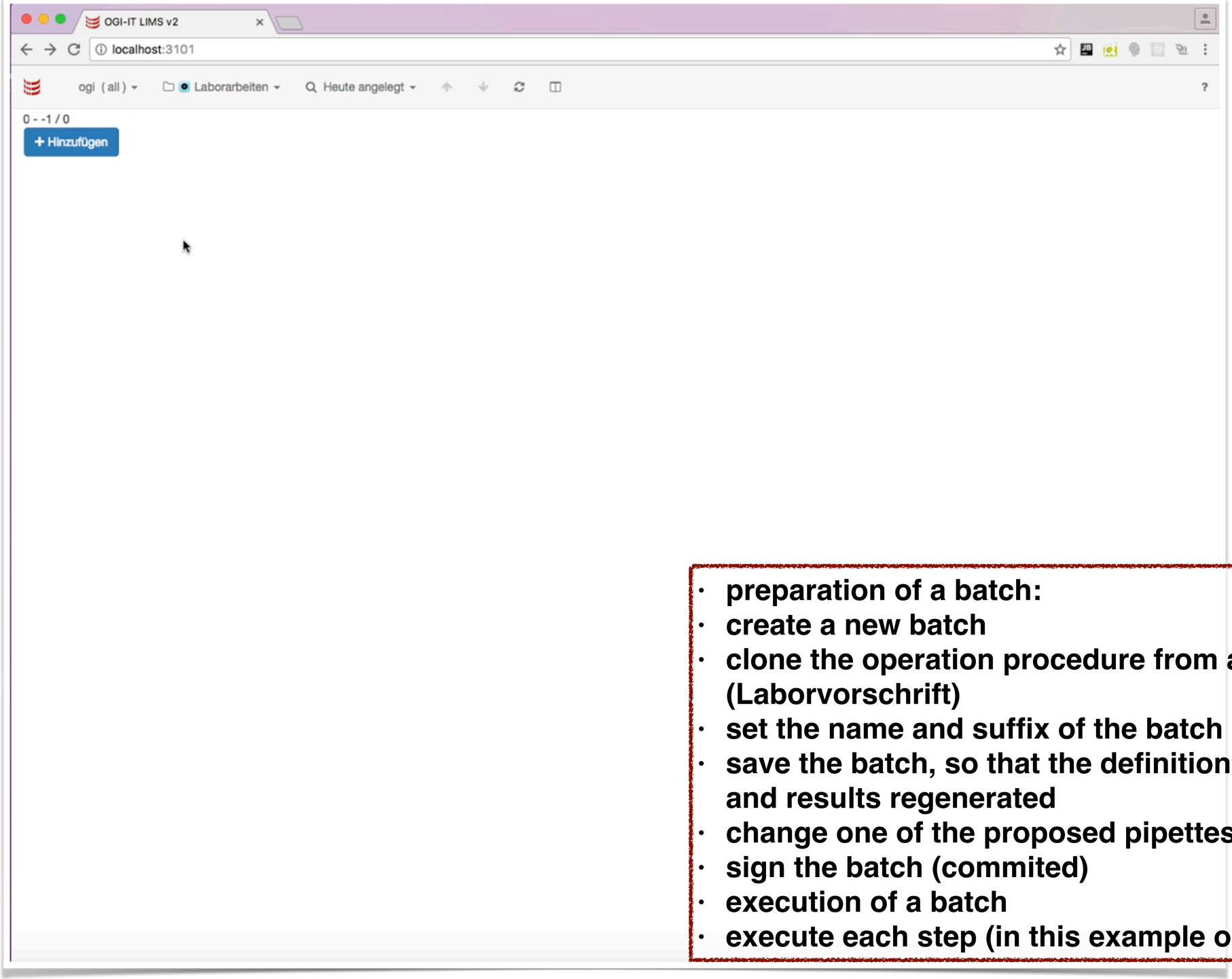
Reporting



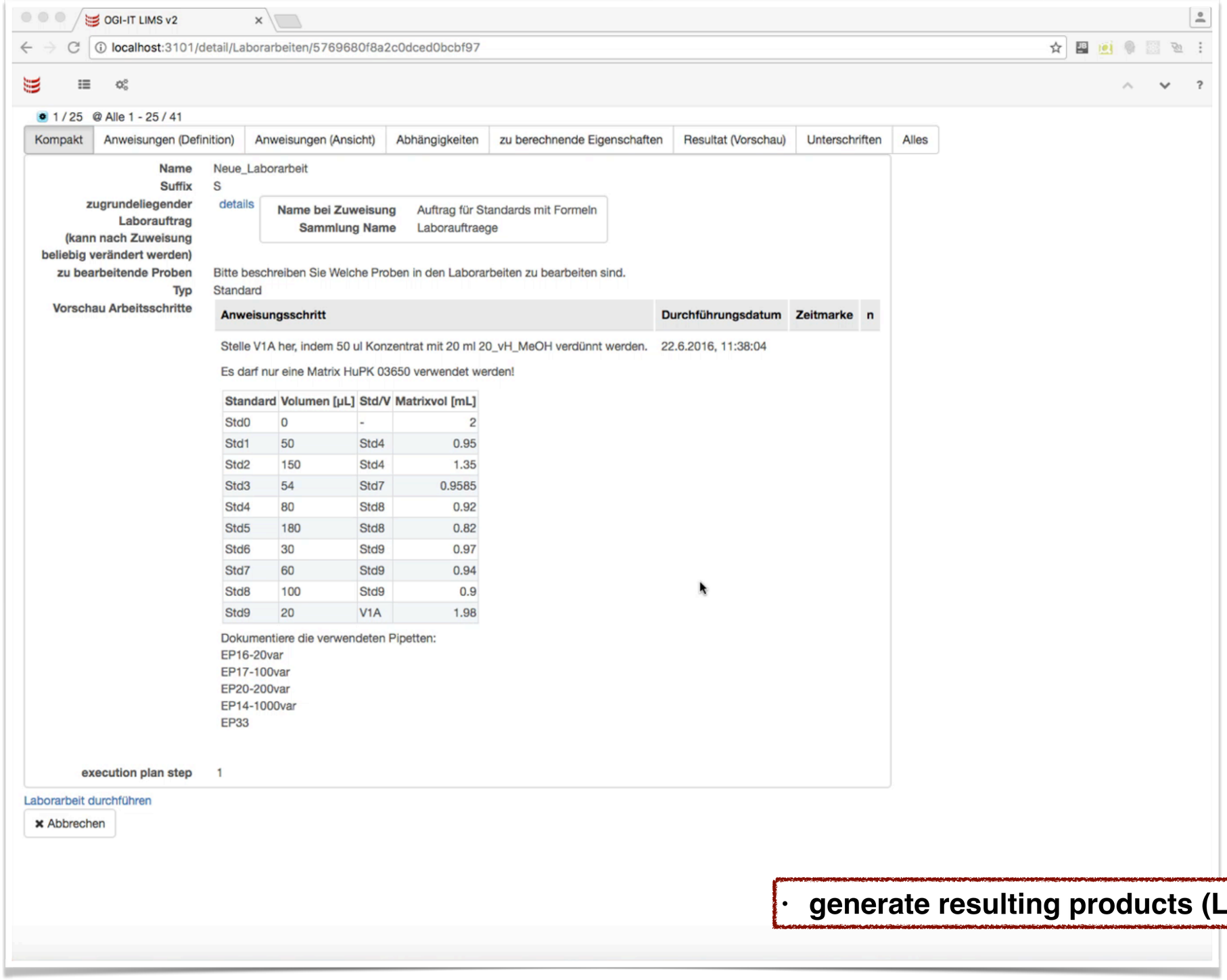
- new report (standard deviation)
- choose template
- choose study
- wait that pdf is generated
- view (HTML) preview
- view pdf with TOC, header and footer

Batches

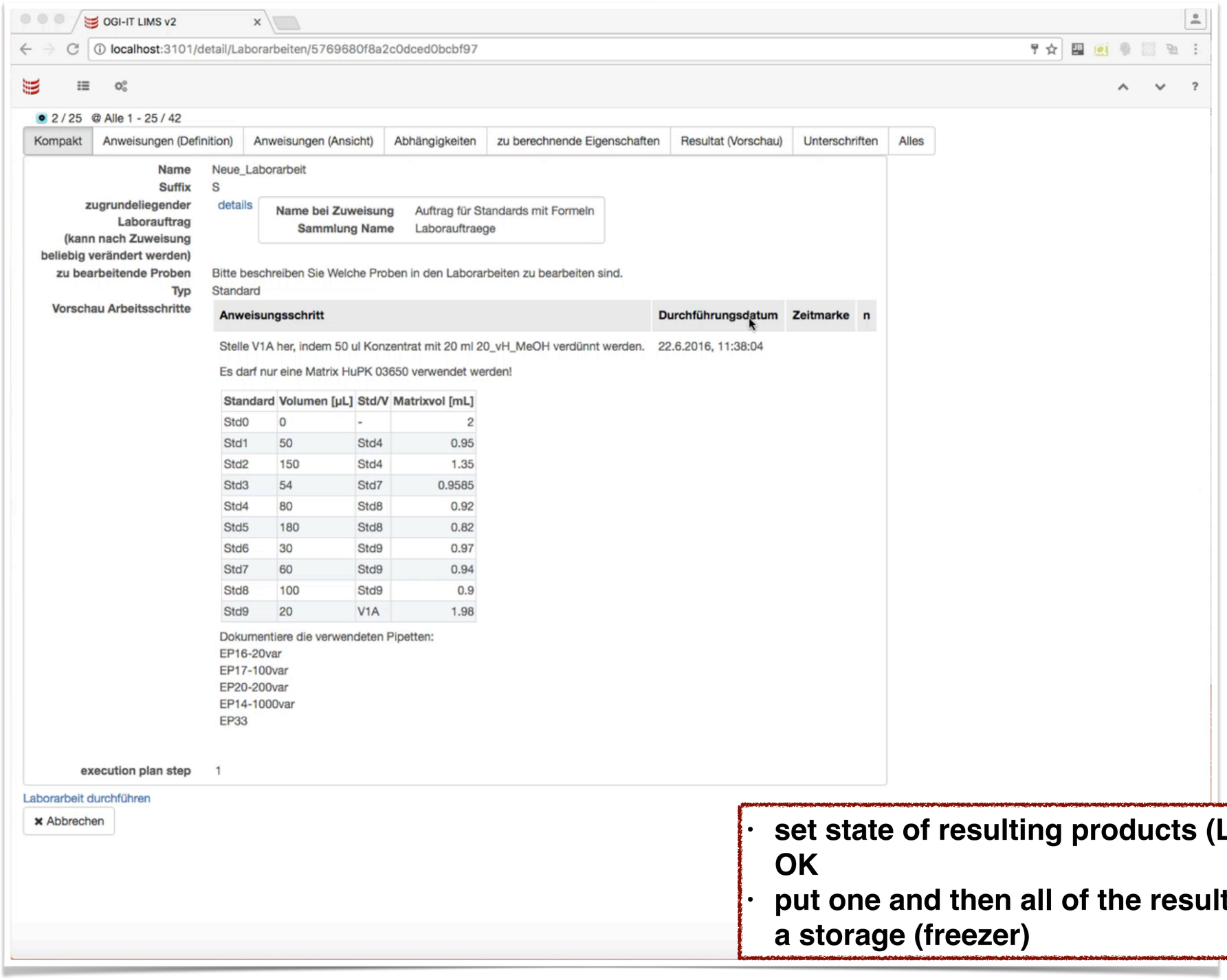
(Laborarbeit)



- preparation of a batch:
- create a new batch
- clone the operation procedure from a SOP (Laborvorschrift)
- set the name and suffix of the batch
- save the batch, so that the definition can be checked and results regenerated
- change one of the proposed pipettes
- sign the batch (commited)
- execution of a batch
- execute each step (in this example only one step)



- **generate resulting products (Laborprodukte)**



- set state of resulting products (Laborprodukte) to OK
- put one and then all of the resulting products into a storage (freezer)

Thank you